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ABSTRACT

To increase understanding of the dimensions of man's impact on his environment and the key issues involved in improving that environment through education and action was the goal of the environmental quality conference held at the University of Wisconsin, Green Bay, on March 28-29, 1968. Contained in this document are the conference proceedings--speeches, discussions, songs, and names of participants. Representatives from universities and colleges, conservation and citizen organizations, and labor and industry presented speeches in the following areas: environmental quality in ecological perspective; issues in land quality, water use, economic development, and air quality; the gap between science and the citizen; environmental issues in industry location; regional design for human impact; examples of environmental improvement; and the quest for a quality environment. (BL)

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INFORMED FORCES FOR ENVIRONMENTAL QUALITY

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CONFERENCE PROCEEDINGS
MARCH 28-29, 1968
UNIVERSITY OF WISCONSIN — GREEN BAY

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The University of Minnesota
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Informed Forces for Environmental Quality

Conference Proceedings
March 28-29, 1968
The University of Wisconsin - Green Bay

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Assistant Chancellor for Extension
University Extension and the University of Wisconsin - Green Bay

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INFORMED FORCES FOR ENVIRONMENTAL QUALITY

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Conference Overview

Dr. Raymond D. Vlasin
Conference Chairman[1]

I am pleased to welcome you to our tri-state conference on environmental quality. I extend the welcome on behalf of Chancellor Edward W. Weidner of the University of Wisconsin-Green Bay, and Chancellor Donald R. McNeil of University Extension. I extend also the best wishes of Mayor Donald A. Tilleman of Green Bay, who will be with us throughout the conference.

This conference, "Informed Forces for Environmental Quality," was organized for varied reasons. I will mention four.

1. A number of us in Michigan, Minnesota and Wisconsin, are deeply concerned about the many ways we daily inflict adverse impacts on the quality of our environment. The producer, the consumer, the public sector and the private sector each contribute to the assault on environment.

2. We are concerned about the rate at which our 20th Century technology permits us to "chew up" our resources. We consume our resources in a manner that destroys or adversely alters their usefulness for other people and other times. Consider how much we would have to discount our Gross National Product if we were to fully account for the negative side effects of our national production. I predict it would be startling.

3. The pervasive nature of pollution is creating distress. It affects our organisms, including man, our natural resources, our spatial relations, our aesthetics--in short our entire physical, economic, social and cultural well-being. Effects of pollution are far reaching; it is widely known that chemical pollution has penetrated even the most isolated portions of the globe.

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[1] Director of Planning and Regional Development, The University of Wisconsin-Green Bay and University Extension, The University of Wisconsin.

4. The citizen and voter exhibits a monumental lack of understanding of the problems, issues, and possibilities pertaining to our environmental quality. In spite of this we expect him to pass bond issues, increase his taxes, and modify his actions or take new actions to enhance the quality of the environment.

People are attacking these problems. But an obvious omission is lack of direct, forceful attention to the growing gap between science and the citizen and the consequent need for more effective ways of spanning this gap.

Thus, a group with deep concern regarding these conditions began to chart a course of action. Members included representatives from universities and colleges, conservation and other citizen organizations, labor and industry, and other leaders from Michigan, Minnesota, and Wisconsin.

We hoped this course of action would eventually lead to more informed citizens and citizen organizations, more informed labor and industry, more informed government agencies, and more informed educators. In short, we anticipated that our efforts and actions would lead to more informed forces for environmental quality.

As a first step we decided to call a tri-state conference on "Informed Forces For Environmental Quality."

The group defined three goals for the conference and subsequent action:

1. To increase understanding of the dimensions of man's impact on his environment and the key issues involved in improving that environment through education and action.

2. To evaluate means of closing the gap between existing scientific knowledge and what is known by the lay citizen and voter.

3. To identify specific efforts that can be taken by educational institutions in cooperation with citizen organizations, agencies, labor and industry to close the knowledge gap and help improve decision making and resulting action.

The planning committee[1] structured a conference with these characteristics:

1. Participants who will speak out on their observations and views, and who will challenge and be challenged for improved knowledge and understanding.

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[1] See Appendix for list of the planning committee.

2. Participants who broadly represent citizens, industry, labor, government, universities, colleges, other educational units, and news and information media.

3. Participants who will report what they have done that is effective and display their useful educational materials in a display room set aside for that purpose.

4. A program that is strong in its technical content and complemented by insights and examples of application.

5. A program that permits and encourages discussion throughout the conference.

6. A program that results in some positive follow up action.

We believe we have arranged such a conference. Now it is up to you. If you sit back and relax, you will likely be pleased. If instead you probe, discuss, confront and challenge, you and other participants will become stimulated and informed on the problems under consideration. The choice is yours.

Environmental Quality in Ecological Perspective

Dr. Frederick Sargent II, M.D., Dean
College of Environmental Sciences
The University of Wisconsin-Green Bay

Discussant

Dr. Howard A. Tanner
Director, Natural Resources
Michigan State University

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Environmental Quality in Ecological Perspective

Dr. Frederick Sargent II, M.D., FAPHA, FRSH[1]

The objective of this conference is to plan how the facts about the deteriorating quality of the environment can be translated into a definitive program of community action--an effective adaptive strategy for preserving and managing the resources of the environment. Although my purpose is to discuss with you, from the viewpoint of an ecologist, some criteria for judging environmental quality, I shall not overlook your conference's objective.

There has been much recent attention given to the fact that man's behavior and his behavioral products have given rise to a deterioration in the quality of the environment. As a consequence man's perception of the resources of his environment has begun to change. He is coming to realize that he faces a crisis of unprecedented dimensions, unprecedented for that crisis threatens the very survival of the human species. In view of this greater ecological sensitivity, Theobald (1967, p. 43) emphasizes, "It is no longer sufficient to argue that a person 'meant well' when his intervention in a personal or social or ecological situation worsened rather than improved the situation. Today it is necessary to possess information, knowledge and wisdom before acquiring the right to interfere."

Inadvertent Deterioration

That the quality of the environment is deteriorating, few would dispute. This environmental condition has been created by man. He brought it about before he fully realized the implications of his impact. Those changes--he called them inadvertent--seem to have been motivated by a religious viewpoint which held that the bountifulness of the environment was for him to draw upon and to utilize in any way he desired (White, 1967). That the bountifulness of the environment was exhaustible or that biological productivity might be disrupted does not seem to have been a serious consideration. Rather suddenly it became evident to him that his actions were deleterious. He discovered, for example, that there was insufficient water to fulfill the diverse and heavy demands placed upon it by industrial processes, power generating facilities, sanitary systems, irrigation, and human requirements. Chemical pollution, thermal pollution, and eutrophication suddenly loomed as problems of staggering proportions. The alternative use of the atmosphere for waste disposal led to air pollution and showed him that vast as the earth's air resources were they were limited and subject to measurable alterations. Because biological productivity could be enhanced in managed ecosystems by fertilizers and biocides, their application was expanded. Then it became clear that excessive use of fertilizers contributed to eutrophication and that biocides had effects on the biosphere far beyond their point of application.

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[1] Dean; Professor of Human Ecology, College of Environmental Sciences, University of Wisconsin-Green Bay, Green Bay, Wisconsin.
FAPHA - Fellow, American Public Health Association
FRSH - Fellow, Royal Society of Health

These uses of the resources of the environment had not been planned as part of a soundly based program of resource management. They were undertaken by particular groups whose concerns and goals were immediate and parochial. When it became clear that such schemes were leading to a depletion of resources and a deterioration of the environment, there arose the need for a strategy to conserve resources and restore the quality of environment.

Conscious Intervention

When it was realized that the need for important resources such as water would exceed the naturally available supply, it occurred to some that by conscious intervention in environmental processes, they might be manipulated to increase their yield for the welfare of man. The quest for water, for example, has motivated man to explore the feasibility of extracting fresh water from the sea and to seek ways of modifying the weather. Modest success has spurred him to undertake more ambitious experiments. Plans to modify the weather, however, are being formulated at a time when it is becoming evident that atmospheric pollution from technological wastes has set in motion alterations of weather the consequences of which can now only be dimly perceived (Sargent, 1967a). That man plans to engineer his environment makes all the more compelling the need for a long range strategy for managing its resources.

Whether we deal with restoring the quality of environment or with engineering the environment, the fundamental issue for a strategy of resources management is environmental quality criteria. These criteria must be framed within the context of an acceptable set of concepts about the environment and the relations of organisms to that environment. For these reasons the criteria must be developed in ecological perspective.

Ecological Concepts

In the course of evolution an inseparable bond developed between organisms and environment. As the environment changed, the organisms adjusted and adapted. This bond is conceptualized in the term ecosystem. This system exhibits metabolism and regulation. The metabolism of the ecosystem appears as complex transactional flows of materials such as water, carbon, nitrogen and so on from the environment through an hierarchy of organisms and back to the environment. The energy that drives this system is solar energy captured in photosynthesis in the green plants. By these metabolic flows the organisms condition their environment and continually recycle detritus deriving from excreta and dead bodies. For example, atmospheric carbon dioxide is maintained through its consumption in photosynthesis. Atmospheric oxygen is maintained through its release in photosynthesis. Regulation in the ecosystem is exhibited in the control of population and in the interactions among organisms and among species.

The organisms of the ecosystem are capable of making adaptations to environments. Across the long span of geological time, these plants and animals have experienced wide environmental changes. The particular organismic composition of this system has varied from epoch to epoch, and the organisms that have survived down to the present represent organisms that have made successful adaptations. It must be emphasized that these adaptations are past-oriented. They reflect the evolutionary experience of the species. They provide no assurance that novel and suddenly different environments will be successfully accommodated.

The dependence of environment on organism, the dependence of organism upon environment, the capability of organismic adaptation to environmental change, all constitute fitness of the ecosystem (Sargent and Barr, 1965). By this concept we mean that organisms are fit for their environment and that environment is fit for supporting organisms. There is a uniqueness about this fitness. It was first lucidly described by L. J. Henderson (1958) in his classical Fitness of the Environment.

Environmental Quality Criteria

These concepts provide useful bases for the formulation of environmental quality criteria. In the first place, there is need to evaluate the magnitude of the deterioration of the environment, the implications of this deterioration for the complex transactional flows in the ecosystem, and the consequences of this deterioration for human welfare. In the second place, there is need to develop quantitative knowledge about the dynamics of the ecosystem, to guide man's drive to engineer an environment that will fulfill his needs and requirements. The criteria would constitute baselines for comprehensive ecological analyses and investigations and guidelines for rational programs of environmental regulation by man.

Consider for a moment some of the problems of this ecological crisis in the context of the concept of fitness of the ecosystem.

Adaptive Capacity of Organisms

First, there is the problem of organismic adaptation. The adaptive capacity of organisms must be judged in perspective of a geologic time scale. Phenotypic plasticity, within limits set by the genotype, of course, provides for adjustments to more rapid changes. However, the adaptive capacity is past oriented and does not assure success in novel environments. In the case of man, there is some evidence that he can adapt to environments never before experienced. The Bantu mine gold at 12,000 feet below the surface where the prevailing temperatures are 32-34°C and the atmosphere is almost saturated with water vapor. There is also some evidence of human adaptation to air pollutants, notably carbon monoxide. Evidence such as this suggests that man may be able to endure some environmental deterioration. The perplexing question, however, is one of time. The changes that he is now effecting are proceeding at such a pace that accommodation to them may not be within his norm of reaction. To this question we simply do not know the answer. In an evolutionary sense, selection serves as an adaptive mechanism, but now there is no time for selection to act. Thus we must probe deeper into the range of man's adaptive capacity.

Within the biosphere there are some curious problems that arise from differential adaptability of organisms within a food chain (Sargent, 1967b). Several species of important fodder plants have made a successful adaptation to high concentrations of fluoride in the soil. The fluoride is bound in these plants as monofluoroacetate. When these plants are consumed by cattle, death rapidly follows. The monofluoroacetate blocks the Kreb's cycle and large amounts of fluorocitrate rapidly accumulate. Citrate intoxication is the cause of death. The accumulation of citrate under these circumstances has been called the "lethal synthesis." The ecological implications of this differential adaptability within the biosphere are clear. Such facts must be carefully noted in evaluating the dimensions and consequences of environmental deterioration.

Essential Links in Ecosystem

Second, there is the question of essential links in the transactional metabolic flows of the ecosystem. The fitness of the ecosystem stems from the continuing flow of materials from environment as detritus. Energy captured in photosynthesis drives the entire system. Continuing receipt of this energy by the green plant is essential for the operation of the system for energy is finally dissipated as heat. The deterioration of the environment from air pollution has set in motion atmospheric alterations that threaten to disrupt this flow of energy (Sargent, 1967b). Man's detritus has begun to accumulate faster than it can be recycled. The concentration of particulates and aerosols in the air is mounting. At lower levels of the troposphere these derive from industrial and automotive wastes. At upper levels they derive from jet airplanes. Atmospheric turbidity is increasing. Haziness, cloudiness and contrails evolving into cirrus clouds provide visible evidence of this trend. The consequence may be a general atmospheric cooling due to increasing reflection of solar energy. If these trends continue there may be a critical reduction in energy input to the ecosystem. What constitutes a "critical reduction" is not known.

Another constituent of this atmospheric detritus complicates the ecological evaluation of the current condition of the environment. Atmospheric carbon dioxide is increasing. By virtue of its greenhouse effect, the carbon dioxide may cause the temperature of the atmosphere to rise. If the present discharges of carbon dioxide released from the consumption of fossil fuels continue, some authorities predict that by the year 2000 the mean global temperature will have risen 3 - 4°C. Such a heating would have widespread terrestrial effects. For example, one can foresee melting of glaciers, rising levels of the oceans, and inundation of cities.

To evaluate the consequences of the deterioration of the environment one must quantify the transactional flows in the ecosystem and identify the essential transactional links. Certainly the green plant is one such important link. While the direct effect of environmental pollution on human health is a matter of great concern, we cannot overlook the indirect effects. To fulfill his nutritional needs and requirements, man depends upon the biological productivity of the ecosystem. If this productivity is disrupted, man may suffer more indirectly than directly. For this reason environmental quality criteria must be formulated for all organisms of the biosphere, not just man.

Multiple Uses of the Landscape

Third, there is the problem of multiple uses of the landscape. There is a finite landscape and the impact of human activities has been felt on most of it. To fulfill his needs and requirements he has increasingly bulldozed, stripped, and plowed the land. To set up communication networks, he has crossed the land with highways and railroads. To provide for recreation he has invaded what wild areas remain. His impact has caused the extinction of many species and has led to the confinement of other species to smaller and smaller natural areas. The movement of species from one wild area to another has been increasingly impeded by barriers--the farm, city, highway. The net result has been to reduce the space occupied by wild genes and to block the flow of wild genes. When viewed in terms of the narrow food base that man now has in the form of domesticated plants and animals, this trend has serious implications.

A reserve of wild genes is a precious resource. It is a source of genes to invigorate domesticates. It is a source of entirely new domesticates that may someday be needed by man. The minimum space required to maintain wild gene pools is not known. The impact of the landscape barriers on the flow of wild genes is not known. Indeed the ecological impact of multiple uses of the landscape is not known. The study of what Odum calls landscape ecology thus becomes an important focus for the environmental sciences.

An Educational Program in Environmental Sciences

What we have been discussing is the need to formulate a strategy for resource management. This strategy involved developing a deeper understanding of the qualities of the environment so that it may continue to provide for human needs and requirements, developing quantitative knowledge of the transactions of the ecosystem so that the system may be modelled and the consequences of particular manipulations anticipated before they are attempted, and developing rational policies for utilizing the natural biological productivity for human welfare. The formulation of such strategy requires a consortium of university, industry, government, and public. The formulation of a strategy for resource management is a central objective of the program of the College of Environmental Sciences.

In implementing this objective the faculty of this College will engage in education, in research, and in service to the community in the field of the environmental sciences. It is the service aspects of the College program that I wish to emphasize.

The deterioration of the environment is but one symptom of the ecological crisis. This crisis has global dimensions. It is not a local problem; it concerns all men. Indeed, the human species is the population at risk in this crisis. Consequently all men must be made to understand the problems and the implications of non-solution. The ecological awareness and perception of man must be sharpened and the ecological comprehension deepened. Nowadays there is too much public indifference and apathy on these matters. The problems do not seem to have local implications; the problems are those of someone else. Why don't "they" do something about the problems? Here "they" usually refers to some governmental agency, scientific experts, industry, and the like. It is my considered opinion that these problems will not be solved until all of us become involved, each in our own way, each having some understanding of the nature of the crisis. It is for reasons such as these that I suggest the solution of these problems involves a consortium. The implication, of course, in implementing their solution may well mean a rather considerable change in our way of life. I suggest, however, that there is no ready alternative.

What can a partnership between the university and the community accomplish in this context? Several recommendations were made by Working Group VI for "A New Agenda for the Church in Mission" (Hall, 1967, pp. 164-5).

"Furnish trained ecologists to interpret field biology and ecology to interested citizens, such as vacationing families at appropriate locations."* (Ibid. p. 165). To implement this recommendation demonstration units might be developed and moved among the recreational areas of northeastern Wisconsin. These units could serve to expand the ecological awareness of vacationers by showing them just how man's impact was acting on an area apparently far removed from places where environmental deterioration was most publicized. For example, how many vacationers realize that their outboard motors are most inefficient? Some 10-30% of the gasoline these motors consume passes directly into the lake or stream to pollute the water with raw gasoline.

"Urge mass media to introduce conservation conscience and land ethics in their programs and advertising." (Ibid.) As a public service the mass media devote space and time to ecological problems, but the space and time are neither adequate nor prime. To be effective the presentations must be timely, continuing, and show evidence of progress at the level of the community.

"Offer short courses and clinics on ecology to conventions of service clubs, churches, banks, and insurance companies, city and county managers, and political leaders." (Ibid.) Through these short courses and clinics the ecological awareness of local leaders could be increased. The pay-off would be more ecologically rational urban planning and legislative action.

These action programs for education aim at the adults of the community. Although the important role of the younger members must not be overlooked, the emphasis on adult education is appropriate. The pace of environmental deterioration is accelerating. There is an urgency to initiate remedial programs. The decisions made in the next two or three decades may well spell man's destiny. For these decisions to be rational and successful, it is, therefore, correct to give adult education the first priority.

The Working Group, however, made no recommendations about educational programs for young people. In spite of the urgency of the present ecological crisis, I think that it is important that ecological concepts and experience be introduced into the program of the local grade and high schools. Here the objective should not be to begin teaching ecologists. Rather it should aim to enhance awareness and understanding of these young people regarding the concept of the ecosystem and the meaning of natural resources and their usefulness to human welfare. They should come to appreciate the variety of landscapes and the diversity of their uses, the significance of their preservation, and the consequences of their misuse. I am pleased to note that the Board of Education of Green Bay has just such a plan in mind. We at the University intend to work closely with the teachers in the schools of this City in carrying out their plan.

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* Emphasis author's

Epilogue

Man is the agent of this ecological crisis. Because of it he is at risk. He must develop a strategy for coping with the crisis. The strategy involves first recognizing the nature and dimensions of the problem and then taking decisive steps that will maximize the well being and minimize the hazards to the survival of human populations. Because the problems of the deteriorating environment are global rather than local, they must be perceived and understood by all people and the people must agree to be involved in the decision-making process. Because the problems are complex their solution will involve a working consortium of government, industry, university and public. The solution cannot be a return to an earlier stage of human history. The direction of time's arrow is irreversible. The solutions would seem to lie rather in improving the efficiency of use of energy, in learning ways to more completely recycle wastes so that they do not accumulate in the habitat, and in probing more deeply into the dynamics and adaptability of the ecosystem so that realistic goals can be set for regulating the quality of the environment. Man indeed now holds his destiny in his own hands. Whatever the strategy he adopts, there will be profound changes in his way of life.

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Discussant Presentation

Dr. Howard A. Tanner[1]

Dean Sargent has made an excellent presentation. He labeled himself an ecologist and stated that he was coming to this audience to discuss some criteria for judging environmental quality.

He has contributed to our meeting as an ecologist and as an educator. He has presented material which advances the stated purpose of the conference. He has several basic messages, one is that we must instill ecological concepts in the public conscience. I couldn't agree more. I think, however, that we have a way to travel before we learn how to explain ecological concepts. I think he has handled a very complex subject admirably well. I'm not certain that all of the audience has grasped all of the significance, and therefore, I'm going to address myself to essentially the same points, perhaps adding a slightly different facet. Again, primarily, towards the same objectives that Dean Sargent is taking.

First of all, I am going to talk on three points: C S A. Now that does not stand for Confederate States of America. But rather, it stands for Concepts, Selling and Application.

The basic concept which will be repeated over and over again, is that wastes are not wastes, but resources to be recycled. (Reference to chart).

There is another concept, and I would call this the concept of esthetic degraders. These points do not appear to interfere with recycling but they do degrade the esthetic qualities. They include billboards, trash, litter, disorder, noise, congestion, and ugliness in general.

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[1] Director, Department of Natural Resources, College of Agriculture, Michigan State University.

Not long ago Economist John Kenneth Galbraith, speaking of these aspects of environmental quality problems, told of the following story: he told the story of a family that takes its colorful, air-conditioned, power-steered, power-braked, automobile out for a tour, passing through cities that are badly paved, made hideous by litter, blighted buildings, billboards, and posts for wire that should have long since been put underground.

They pass into a countryside that had been rendered largely invisible by commercial art. They picnic on exquisitely packaged food from a portable ice box, by a polluted stream and go on to spend the night at a park, which is a menace to public health and morals.

Just before dozing off on an air mattress beneath a nylon tent, amid a stench of decaying refuse, they reflect vaguely on the curious uneveness of their blessings.

The concept displayed on my chart, and the basic concepts put forth by Dean Sargent, and by others speaking to this point, is that if the wastes continue to accumulate it is man, himself, who is at risk, and as this risk begins to crowd in on him, we can begin to see its effects. I think perhaps in the conflict of our inner cities, in the breakdown of social structure, legal processes, respect for life and property, in the production of the underfed, undereducated, human being who is completely unsuited for a productive life in tomorrow's world, we see the true consequences of environmental degradation.

We see them first where man has been most thorough in his design of the environment. Aren't we saying that man is going to design his environment? If he is to be the designer he has to do much better than he has. He has to get started at it soon. Perhaps missed in this overall concept, that a part of this environment is man himself--the effects of man on man. Certainly if he is going to control and design his environment he must also control and design his population, their distribution, their numbers and their characteristics.

So much for concepts. I come to the second point of selling.

These are the ecologist's concepts and these are the concepts that I believe. Unfortunately we have a knowledge gap. I just came from a meeting of educated people, productive scientists in the fields of law and economics, discussing primarily how to manage water for the future. They're addressing the problem with all the dedication that you and the participants are, here today. Yet they never once, not once in three days, mentioned the word ecologists. Not once did they directly recognize the implications of the ecological concepts that we are talking about.

Somehow we have to sell. To sell this concept, we have to sell up through our levels of government and down through all levels of our society, and we have to sell it laterally to other scientists. I think this is the subject of our meeting today. I don't think that Dean Sargent told you how to sell it, I'm sure that I cannot tell you how to sell. I think there are other disciplines represented here among the workers generally under the umbrella called Community Development and Extension that can apply existing techniques and past strategies to these concepts once they are clearly stated and understood, and begin to deliver them as a message. Through their efforts we should be able to gain a consensus which will yield us democratic action to the problem.

I have one other area which I wish to address--that is to the ecologists themselves. These are the people I talk with, these are the people I try to understand.

What I have learned from them is that they understand ecological concepts very well. They have a great deal of difficulty when they attempt to quantify and this is the point that Dean Sargent spoke to so well.

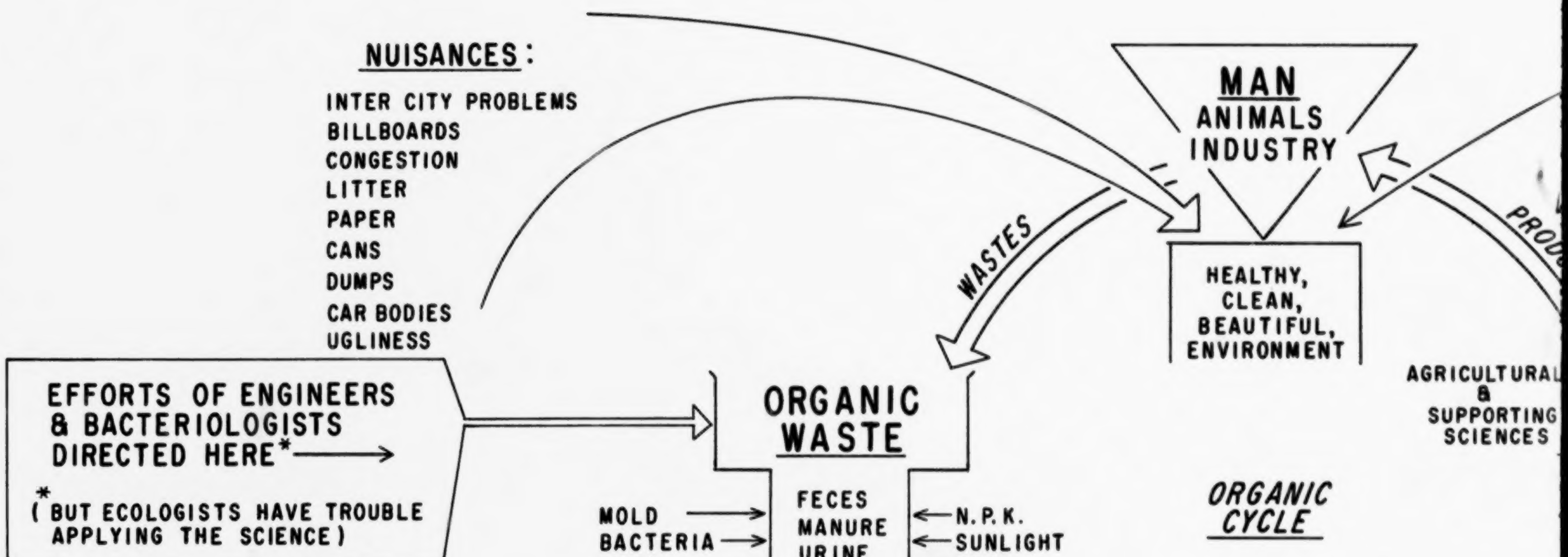
If suddenly today we could bring forth a miracle and win with this selling job and with this public consensus, the privilege of designing our environment along ecological concepts I have to stand here and tell you today that the ecologists are not properly equipped to do this.

They can tell about biological activity of sewage lagoons, about the assimilation of carbon dioxide from the atmosphere by growing plant communities, about spray irrigation of waste water and its factors of energy and heat and nitrogen and phosphorus and potassium. But when I come to them with questions typical of a city manager or mayor saying how much pond space do I need for a sewage lagoon if I have 8 million gallons of waste water per day? What kind of retention time to produce an acceptable quality from this ecological community? How many acres of alfalfa must I have to spray irrigate in order to solve my problems of recycling wastes? How much heat do I have to plug in from my steam generating plant, from my atomic powered electrical generating plant?

How many greenhouses do I have to have? How many pounds of plants will I produce? How will I recycle these? And so on.

When I come down to ask the ecologists these questions they reply, that these are complex communities which are only imperfectly understood; the output of which is very, very difficult to assess.

In closing my message is, sure take the ecological concepts and sell them. You've got a long arduous job ahead and time is short. At the same time I say to the ecologists, while the community development people are selling your message about concepts, for God's sakes, man, build the scientific know-how to translate your science into an applied technology. A sense of urgency must prevail among all groups.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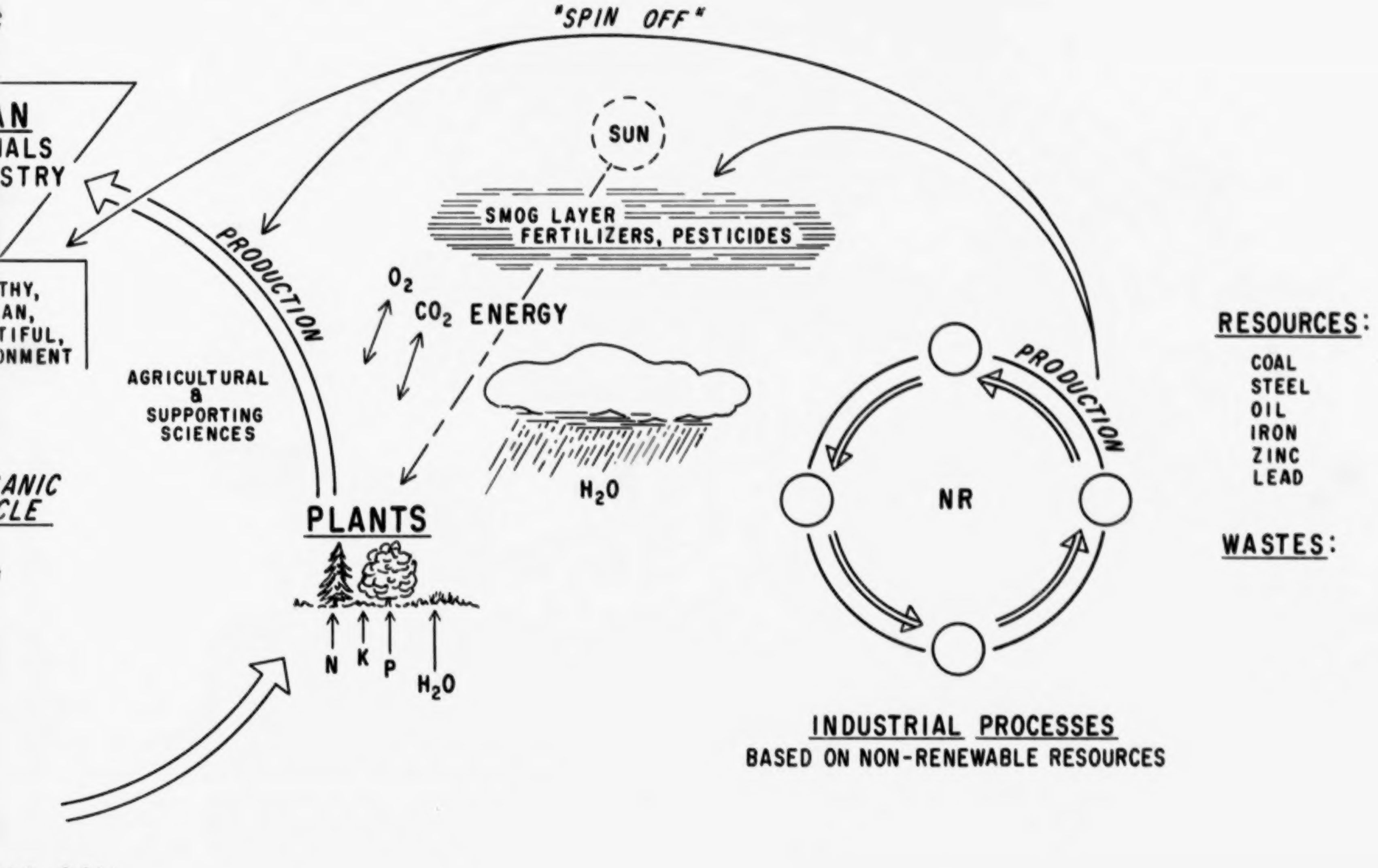
N.P.K.
SUNLIGHT
HEAT
ENERGY
H2O
O2
ORGANIC CYCLE
DECAY PROCESS
TOO SLOW !
INADEQUATE !
CONCEPT WRONG !
ORGANIC SOIL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PRODUCTION
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RESOURCES:
COAL
STEEL
OIL
IRON
ZINC
LEAD
WASTES:
INDUSTRIAL PROCESSES
BASED ON NON-RENEWABLE RESOURCES
IC SOIL

Key Issues
in Land Quality

Minnesota Panel

Moderator Mr. Leslie Westin, Director
Higher Education Coordinating Committee
Minnesota

The Consequences of Soil Pollution
Dr. William P. Martin
Head, Soil Science
University of Minnesota

The Consequences of Soil Pollution

Dr. William P. Martin[1]

The Minneapolis Star for Friday, March 8, 1968 headlined: Johnson asks 1.2 billion for conservation...a program to conserve America's natural resources, "not only for man's enjoyment, but for man's survival." In this program, the President put priority on the goal of pure water and air, ending despoiling of the land and preserving and creating beauty. He included strip mine reclamation, waste treatment plants, control of chemical contaminants of drinking waters, and solid waste disposal programs, from garbage and farm wastes to automobile wrecks.

The population explosion is well-known and documented, and we are an "affluent" society. We like meat products in preference to cereal grains. We are now supporting in this country animals which produce waste products mostly in the form of manures equivalent to 1.9 billion people and largely without organic waste treatment facilities. We have more cars than any other people and our superhighways "despoil" the land; we have the most efficient agriculture in the world which is dependent on big machines, lots of fertilizer and pesticidal chemicals, and for the sake of efficiency, obtaining nitrogen for crop production from the fertilizer bag rather than assisting with the disposition of the mountains of animal manures that at one time constituted the chief source of nutrients for crop production. And erosion and water polluting sedimentation though slowed somewhat are active in many areas even though the soil conservation movement of the past 35 years has tried valiantly and with some success, to create a public consciousness of the significance of soil erosion to our national well being.

It is time that we take stock of our land sources and see to what extent this so-called self perpetuating environment is in fact threatened by pollution. Soil is an essential link in the food chain from plants and animals and to man, and we must be concerned with its use as a waste disposal system; about the slow but perhaps significant buildup of pesticidal chemicals; about the fixation, volatilization and movement of plant nutrients in soils and their significance in water contamination; about radioactive dusts and fallout on the land; and about the rapidly increasing acreages of land that are being taken out of production or from living and recreation areas to accommodate the billions of tons of waste that are coming from our burgeoning society.

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[1] Head, Soil Science, University of Minnesota.

Dr. Cecil Wadleigh, Chief of the Soil and Water Conservation Research Division, USDA, likes to cite a statement from Professor E. W. Hilgard, a distinguished soil scientist in the late 1800's, who gave a "hard-hitting" lecture before the Mississippi Agricultural and Mechanical Fair Association at Jackson, November 14, 1872. Professor Hilgard was gravely concerned over poor practices which were ruining the land and silting the streams: "If we do not use the heritage more rationally, well might the Chickasaws and the Choctaws question the moral right of the act by which their beautiful parklike hunting grounds were turned over to another race, on the plea that they did not put them to the uses for which the Creator intended them." It was another 60 years before the dynamic leadership of Dr. Hugh Bennett and the first Chief of the Soil Conservation Service, and contemporaries, finally got through to the people and the conservation of soil and water came under organized attack so as to decrease air pollution from the tremendous dust storms of the great plains in the thirties and stream contamination from accelerated runoff and soil erosion.

The present concern with pollution and environmental quality can, in fact, effectivate a healthy rejuvenation of the conservation movement and suggests that the public is becoming cognizant of the problem of wastes and their disposition, that there is appreciation for aesthetic values and recreational opportunities and that to maintain a better quality for our environment we must have many more facts on which to base management decisions which takes time and money and, of course, supportive legislation.

In the time that remains, I should like to outline categorically a number of the contaminants of our soils and thus our waters and significance in the context of environmental quality. I have relied substantially on a report entitled: "Wastes in Relation to Agriculture and Forestry" written by Cecil Wadleigh, Chief of the Soil and Water Conservation Research Branch, U.S.D.A. and made at the bequest of the Secretary of Agriculture. It will be published shortly. And also on the just published Symposium No. 85 of the AAAS, titled: "Agriculture and the Quality of Our Environment," N. C. Brady, Editor (476 p. 1967, AAAS, Washington, D. C.). I had the privilege of chairing the section on "Soil Pollution."

Radioactive Substances These may be possible contaminants of soil and water and come from several sources although mostly from nuclear testing of atomic weapons. Although there are some 200 isotopes of 35 elements which have been identified in nuclear fallout, the isotope of most concern which did reach the soils of the upper Great Lakes area in substantial amounts was strontium-90, although cesium-137 and iodine-131 could reach concern levels in food plants and in milk. Strontium-90 is most important because of its relatively long half life of 28 years and the fact that it substitutes for calcium in soils and plants and thus in milk and in human and animal bones. I should note that Sr-90 is held tightly by surface soil particles and humus, the so-called base-exchange complex, and can only move into water supplies by soil erosion. A national monitoring network still operative lends assurance that soil and plant contamination did not reach hazardous levels in this country and that it is diminishing with the existence of the test ban treaty between Russia and the United States and Britain. Research has been modest on methods for decontaminating soils for it is obviously impractical to scrape off the surface or bury by deep plowing. Unrestricted testing of nuclear weapons is always possible if war gets out of hand and this could be serious for agriculture and our food supply.

Dust Brief mention should be made of soil blowing as a contributor to air pollution. Good topsoil is still being lost to wind erosion and particularly in this upper midwest area where winter plowing is necessary. If the soil is left in a rough plowed state, movement of soil by wind is minimized; if it is disked and smoothed after plowing, it will often blow badly. This year because of light snow cover, dust storms have been prevalent as many here have noted and in Minnesota, at least, many roadside ditches are filled with topsoil from the surrounding fields. Respiratory ailments intensify. A prediction equation has been developed to provide technical guidance for action groups or agencies on measures that are needed to reduce wind erosion. Much more research is needed!

Sediment Soil as a contaminant may also be in the form of sediment washed into lakes and streams by land runoff. Erosion is the dominant problem on 39 percent of the cropland in the Lake States area or some 16 million acres, according to the recently completed Conservation Needs Survey.[1] It is a secondary problem on some 14 million acres. Half the sediment comes from agricultural lands and the total sediment load in the United States is some 4 billion tons a year. Urban and industrial sites and highways during construction also erode and make substantial contributions to local streams. Most of the erosion sediment is deposited enroute, with only about one-fourth getting into lakes and stream courses. Research has shown that land cover and treatment is the chief deterrent to sediment delivery and much empirical data have been accumulated on susceptibility of soils to erosion. Use has been made of soils with markedly different characteristics, different slopes, different kinds of cover and this has been used to produce a mathematical model called the "universal erosion equation" which aids in the prediction of soil losses so that soils can be managed so as to keep the annual soil loss below 3-4 tons/acre. Much work is needed on soil structure and aggregate stability, on water infiltration vs. runoff particularly during soil freezing and thawing in this regional area and on integrated systems of management that will reduce runoff and yet provide needed surface drainage with minimum erosion.

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[1] Soil & Water Conservation Needs--A National Inventory (MSC Publ. 917, U.S.D.A., Washington, D. C., 1965)

Plant Nutrients Soil erosion produces sediment that contains nutrient elements that not only represent significant losses for crop production but it is the nutrient enrichment of surface waters that produces the algal bloom and growth of aquatic plants that is becoming a prime source of concern in the contamination of water supplies. Lake eutrophication, off-taste, foul odor, fish kills (because of oxygen depletion from decaying plants) and "unsafe" waters for recreational uses are frequently read about in today's newspapers and major conflict in use of land resources is becoming evident. Nitrogen and phosphorus are the two elements principally involved and it should be emphasized that they do not come largely from runoff and erosion from agricultural land though contribution is obviously made and such sources do impair the usefulness of farm ponds or shallow land-locked lakes for example.

Phosphorus applied to agricultural lands as fertilizer is promptly reverted to "unavailable forms" and 10 to 20 percent only becomes available for plant nutrition. Even where erosion occurs and fertilized soil becomes sediment in a water supply and total phosphorus may be as high as 1,000 pounds/1,000 tons of sediment, only about 10 percent is available for the growth of water plants, the rest remains in an unavailable state. Phosphorus cannot move through the soil in the soluble state; and in rare instances water in drains from fertilized fields will be found to yield as much as 1 ppm of phosphate. Total phosphorus has too often been used as a criterion of "availability" and this is very much in error. Crop production to meet our rapidly increasing food demands is important, and use of fertilizers at an accelerating rate is necessary. We used 32 million tons of commercial fertilizers in the United States on our fields and gardens in 1966 and 2 1/4 million tons of this in our three Lake States. Though appearing to be large, it is modest in contrast to say Germany or the Netherlands where they have used almost ten times as much on an acreage basis for many years. The facts do not substantiate major concern at this time, though we must be concerned about the future. Sediment, in fact, because of high phosphorus fixing abilities, can and does decrease and deactivate much of the soluble phosphorus in lakes and streams.

If the phosphorus doesn't come largely from farmlands, where does it come from? Careful examination of the evidence suggests that most of the phosphorus comes from sewage, whether raw or treated and largely from the use of household detergents, which on an average amount to about 2 pounds of P per year and from barnyards and feed lots. The recent Wisconsin report on "Excessive Water Fertilization" to the Natural Resources Committee for State Agencies (January 31, 1967), substantiates this generalization. Septic tanks are a prime source of contamination and particularly when clustered around recreation lakes. And from the soils standpoint, because soils are readily dispersed by the phosphate based detergents in the drain tile areas, thus reducing soil permeability, soil and water pollution and outbreaks of infectious diseases have resulted.

Nitrogen Excess nitrate in drinking water above 45 ppm or 10 ppm N can be harmful to children and toxic to livestock--not because of the nitrate as such but because it is reduced to nitrite which interferes with the respiratory system. Nitrates in water supplies though mostly found in modest amounts may come from sewage or septic tank effluent from feed lots to barnyards, from field fertilization, or from the mineralization of soil organic nitrogen compounds. Nitrates are soluble in the soil solution and will move through the soil. In the soil system, organic forms of nitrogen are oxidized by soil microorganisms and the nitrogen released as the ammonium ion which is tightly held by the clay and organic matter soil colloids. These ions are easily removed by nitrifying bacteria which oxidize the ammonia to nitrate which is not fixed and which will move through the soil as noted. However, some of the nitrogen is utilized by plants and much of it is reduced by denitrifying bacteria under anaerobic conditions to gaseous nitrogen which escapes to the atmosphere to complete the nitrogen cycle. We don't have much information on the relative contributions of nitrogen from the above sources. George Smith[1] from Missouri has concluded that nitrogen from livestock feeding operations is significant and in the Wisconsin Water Study above noted, domestic sewage and land runoff where manure has been spread on frozen soils, were suggested as prime sources of contamination. Fertilizer nitrogen will increase in importance as nitrogen use increases, and we are expected to double our expected usage in this country to approximately 8 million tons in the next few years. Small amounts of nitrate nitrogen regularly "escape" to underground supplies in permeable soil areas mostly in late fall and spring when soil microorganisms are relatively inactive. It is important that we use only enough to satisfy cropping needs so that surplus amounts will not be available to reach groundwater areas. Nitrogen in runoff waters is mostly associated with sediment load, and is part of the organic matter fraction of the soil. Average annual losses estimated for a 7 year period from natural-runoff erosion plots in western Minnesota varied from 31 to 183 pounds per acre. Plots were 72 ft. long on a 6 percent slope Barnes soil designed to maximize runoff and erosion under varied soil management operations.[2] An accelerated research program is surely warranted for we badly need quantitative information in this important area.

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[1] G. E. Smith. Nitrate problems in water as related to soils, plants and water. Special Report No. 55, University of Missouri, Columbia, 1966.

[2] D. R. Timmons, et al. Runoff nutrient losses from Barnes soil in west-central Minnesota. Minn. Science, Minnesota Agricultural Experiment Station, St. Paul, In Press, 1968.

Animal Wastes The disposal of waste materials from farm animals which in the United States aggregates over 1 1/2 billion tons annually has become a management problem of staggering proportions. To illustrate, Minnesota alone with 14 million chickens and turkeys, 4 million cattle, 1 1/2 million dairy cows, 2 1/2 million hogs and 3/4 million sheep, in round numbers, has a waste disposal problem equivalent to a population of 66 million people. Ten hogs, 2 feeder cattle or 1 dairy cow will excrete roughly 150 pounds of nitrogen per year and these same animals per thousand pounds of body weight will excrete from 17 to 45 pounds of phosphorus.[1] The rapid development of big operations means that much of this material is produced in concentrated supply. A "vertically integrated" poultry enterprise of 50 to 60,000 birds will produce 3 tons of waste daily and a 5,000 head feedlot will produce 130 tons of manure and 50 tons of liquids. Normally this manure would be returned to the land for decomposition (1-2 acres/dairy cow, for example) and release of plant nutrients, but increasingly the modern farmer is finding it cheaper and more efficient to get his nutrients from the fertilizer bag. Labor costs for haulage and disposal are high and such wastes are becoming a public nuisance. Lawsuits are becoming more common.

There are other organic wastes, of course, and we lack economical procedures for effectively handling the "mountainous quantities" of putrifiable materials coming from sewage, garbage, canning companies, pulp mills, lumbering operations and crop processing industries as well as from domestic animals. Disposal and utilization costs in the future will rise as public demands for pollution control become mandatory. Food production costs will increase. Soil is the ultimate disposal medium, and it is here that these waste products will be "biologically incinerated." Research on more economical utilization and disposal methods with the development of needed technology so as to minimize environmental pollution is badly needed.

Pesticides Pests quite obviously are a threat to our food supply as well as to our health and comfort and must be controlled. Pests are myriad in number including the insects, nematodes, pathogenic bacteria, viruses, weeds, fungi and also higher plants and animals. There are over a million species of insects alone representing 80 percent of the earth's inhabitants and annual losses due to weeds are estimated at 2 1/2 billion dollars. Control of pests is today largely through the use of chemicals which have proved notably successful. However, there is developing public concern over contamination of the land by chemicals, particularly the chlorinated hydrocarbons which are long lived and which have shown up in measurable amounts in fishes and wildlife and in man. It is in this area that nature's ecological balance has been most severely disrupted in support of man's food and fiber needs and particularly in the non-cultivated areas. Although believed not to be serious at this time by many, obvious misuse of chemicals has occurred where there have been inadequate controls or a lack of understanding of the hazards involved.

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[1] L. R. Webber: Soil Pollution, Ontario Pollution Control Conference, Dec. 4-6, 1967, Toronto, Ontario and Department of Soil Science, Annual Progress Report, University of Guelph, Guelph, Ontario, April 1967, pp. 45-49.

The use of pesticidal chemicals has increased tremendously in the past ten years from roughly 100 million pounds to 800 million and the USDA has accepted registrations on over 25,000 formulations using some 360 active ingredients. These were used on approximately 200 million acres or nearly one acre in 10 in the continental United States and herbicides alone are used on a third of the national cultivated crop acreage each year.

The heavy metal pesticides like lead, copper and mercury are indestructible in the soil and disappear only by mechanical removal and incidentally, a recently completed study in our department (Professor L. Hanson and Assistant M. Singer) showed up to 700 ppm of lead have accumulated in soils adjacent to some heavily traveled highways leaving the Twin Cities area. Certain organic chemicals like the triazine herbicides and chlorinated hydrocarbon insecticides are resistant to chemical and biological degradation, to leaching, or to volatilization and may persist in the soil for weeks or years. DDT and toxaphene are persistent with half lives of 7 to 8 years, whereas many of the organic phosphorus insecticides such as parathion and malathion are readily broken down to non-toxic and mostly water-soluble products in 2 to 3 days. However, with the extremely sensitive analytical methods (electron capture chromatographic and neutron activation) now available, residues in the parts per billion range can be detected and it is found that most raw agricultural commodities contain from 0.001 ppm to 0.01 ppb (billion). It is necessary that the Food and Drug Administration establish safe limits for the amount of pesticidal residue that may remain on food crops. These tolerances are established at the lowest level of safety even though larger amounts would still be safe. Zero tolerances have been established for some like aldrin and dieldrin, for example, though most tolerance levels are in the few to fractional ppm range. There are many programs for monitoring food, the environment and even people. The "marketbasket" surveillance of food to be eaten has shown clearly that the current dietary intake of pesticidal chemicals is well below safe standards established by the United States and the World Health Organization.

Little information is available on the behavior of pesticidal chemicals in soils. Though they are mostly adsorbed in surface soil layers, this is dependent on clay mineral and organic colloid contents, moisture, nature of the exchangeable cations, temperature, and structure or adsorption groups on the chemical. Soil microorganisms readily decompose most organic chemicals which is the reason they do not accumulate in most soils and repetitive uses are possible.

The fact remains that the toxicology of residual pesticides is somewhat unpredictable so that much more information is needed on their fate in soils and in water where they are mostly attached to erosion sediments and the management factors and climatic conditions that moderate adverse effects in the environment.

In conclusion, may I suggest that the natural biosphere based on use of land and water resources had been altered significantly by man to assure food and fiber supply and to favor our living and recreational interests. But we have had to use management practices which accelerate the production of wastes or input amendments which increase the pollution hazard. Pollution of the soil-water complex occurs mostly because we have no other medium for our waste disposal systems. Soils in the form of sediment and associated nutrients may contribute to water pollution. Soils, however, are in turn contaminated by man, though fortunately soils are somewhat self-rejuvenating by interaction of physical and biological components. Runoff from the land, though serious in sedimentation, has probably not been responsible for major buildup of phosphorus and nitrogen in surface waters with resultant eutrophication. Sewage and detergents are much more serious in this context. Nitrates but not phosphorus will move through the soil into groundwater supplies to produce above normal levels in some locations and particularly in high density feedlot or faulty septic tank installation areas. Monitoring programs maintained on widely scattered soils and waters are reassuring in that they do not reveal a general buildup of pesticidal chemicals in the biosphere, although the chlorinated hydrocarbons are generally found to be present in the fractional parts per million range, including foods. Much more attention must be given to investigate studies on the many diverse problems arising from our need to increase farm efficiency and at the same time accommodate the multiplying wastes of our burgeoning society. It is the scientist who must develop and refine the principles on which the conservation of our soils and waters, and the "wholesomeness of our environment" are based.

Water Use Issues in Economic Development

Wisconsin Panel

Summary Dr. Raymond J. Penn
Professor, Department of Agricultural Economics
University Extension, University of Wisconsin

(from "A Resource Paper on Wisconsin Water Issues," distributed to conference participants)

Water Use Issues in Economic Development

Dr. Raymond J. Penn[1]

(Summary of resource paper prepared for Environmental Quality Conference)

A Wisconsin committee consisting of William Sayles, Division of Resource Development; Robert C. Wylie, Vice President and General Manager, Wisconsin Valley Improvement Company; and Edmund M. Brick and Raymond J. Penn, University of Wisconsin Extension, compiled the comprehensive resource paper on Wisconsin's experience in using, protecting and developing its water resource.

Also contributing to the report were Professors Robert McCabe, Douglas Yanggan, and Donald Schink. Summary of a document by W. E. Scott was included.

The report is in three sections: (1) The history and experience to date in the areas of industrial use, agricultural use, protection of public trust in water, pollution control and the 1965 Wisconsin Water Law. (2) A brief statement of some of the issues we face and (3) a statement on how these issues affect or are affected by different uses and public activities including statements on industrial use, agricultural use, municipal use, recreational use, wildlife needs, integrated management of Wisconsin's water resources under the Water Resources Act, and integration of water planning activities.

The major emphasis of the resource paper focused on two basic ideas which have been most significant in Wisconsin's experience.

The first is that water issues can neither be understood nor resolved without relating them to the social and economic development of the area at a specific point in time. Water use issues and problems are related to the land uses at the edge of the water. As a result then, the report integrates the use of water with the use of the shoreland.

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[1] Professor, Department of Agricultural Economics, University of Wisconsin, Madison, Wisconsin.

The second is that resolution of the natural resource and particularly water use issues are usually better and more effective when communication flows between all groups and when all groups participate in the decision either directly or by consensus. It is important for many citizen groups, private enterprises, and governments to participate not only in defining problems, but in developing workable management programs to improve our environment.

Section I is devoted to how Wisconsin has met water issues in the past, the history of how water has been used and developed and what have been the state's policies regarding protection and control. Five areas are presented:

1. Industrial Uses and Development (of water) - The Wisconsin Valley Improvement example
2. Agricultural Uses of Water
3. Selected Highlights of Wisconsin's Effort to Protect the Public Trust in Water
4. Water Pollution Control in Wisconsin
5. Wisconsin Passed a New Water Law in 1965.

Since each part is a summary and necessarily arbitrary, and each was prepared by different experts, differences of opinion and factual interpretation should be expected.

The second section of the report lists briefly some of the water issues the committee considered.

1) Population increase is putting tremendous pressure on our natural resource base. No longer is it possible to use the water to carry away the wastes of cities, farms, and industry. No longer can everyone have a shoreland lot and at the same time enjoy the natural beauty of the lake or catch the fish he once did. The use of water can no longer be free. Substantial investments, both private and public will be needed if we are to make use of our resources without destroying them.

2) Conflicts between users will become more severe as the value of the use increases and investment needed to protect the resource increases.

3) Water users should be guided by a developed managment program for all water. In the past, each water user needed to consider little more than his own operation. And one plan of operation was possible when using surface water, another when using flood water, another when using underground water, etc. An integrated water management program is needed and procedures are needed to keep the program abreast of the times.

4) Wisconsin's water law or for that matter, any integrated management plan requires the establishment of different uses and the priorities between uses. Regional differences in water uses do exist and should be recognized.

5) A water use may become established but society progresses to where that use may need to be changed or abandoned. What procedures can be established to change the use?

6) A similar issue is how can a user get a sufficiently secure right to the water so that he can make the necessary investments to use it efficiently.

7) When we make the commitment to maintain the quality of our water, it is necessary to establish water quality standards. The nature of these standards, the methods of establishing them, and their impact on the water users will most certainly be issues of the future.

8) Water management and economic development programs should be integrated. Coordination of water management plans with economic development programs may be expected to raise issues.

9) Protection of the interest of the future water resource users and those who have a small current interest will need continued attention. As in the past, this responsibility will probably have to be carried by a government agency. Care is needed, however, in distinguishing between what is public and what is private.

The third section contained a series of statements about water use needs in the future.

1. Future Industrial Water Issues
2. Future Problems in Agriculture's Use of Water
3. What's Ahead for Cities
4. The Recreation Enterprise and its Environment
5. Water and Wildlife
6. Pollution Control Problems
7. A Suggested Shoreland Protection Approach

Attached as appendices to the report is a summary of the Wisconsin Water Resources Act, Chapter 614, Laws of 1965 as modified by 1967 legislation and a report of the Natural Resources Council of State Agencies, March 26, 1968, which explored structures for Wisconsin participation in an Upper Mississippi River Basin Plan.

Since the report has been distributed to all participants, no further summary will be made. Extra copies of the report may be obtained by writing Professor Ray Penn, 340 Agricultural Hall, University of Wisconsin, Madison, 53706.

Air Quality Issues

Michigan Panel

Effective Air Pollution Control Difficult
Dr. James Harrington, Professor
Engineering, Michigan State University

Michigan's Air Pollution Law
Mr. Bernard Bloomfield, Chief
Air Pollution Control Section
Michigan Department of Public Health

Some Results of Air Pollution Control
Mr. Morton Sterling, Director
Detroit and Wayne County
Air Pollution Control Agencies, Detroit
and Wayne County Health Department

Effective Air Pollution Control Difficult

Dr. James Harrington, Jr.[1]

The degradation of our environment by air, water and soil pollution, by noise and by unsightly structures and storage areas is the result of our willingness to tolerate such conditions. Like a smokey chimney, a dirty house or a messy yard, environmental pollution can be eliminated once we have the determination to do so. Why, for example, should our river banks display the backs of stores, parking lots, waste storage areas and garbage cans when they could contain parks, flower gardens, fountains, walks, theaters, restaurants, playgrounds and boating clubs? Why should we tolerate the ugly and the uncomfortable in our surroundings when we could create the beautiful and the enjoyable? In how many cities in America can one sip a refreshing drink in an outdoor cafe under shady trees with a pleasant view in clean air? Somehow in our intense struggle to build a dynamic industrial society, we have lost sight of many things which make living in that society worthwhile.

Today I would like to discuss one aspect of that environmental degradation; namely, air pollution. In the days when towns and factories were far apart one could emit pollution into the air and count on it becoming diluted in a short distance by the highly turbulent action of the atmosphere. Dilution took place in three ways. First, the concentration was reduced directly in proportion to the wind speed; by doubling the wind speed one halved the concentration. This factor was particularly favorable in Michigan where the mean annual wind is strong. Second, the plume was spread laterally by the constantly changing direction of the wind and by lateral turbulent spread after the pollutant left its source. Third, the plume was spread vertically by turbulence generated by the roughness of the terrain and by the action of thermal currents. As long as one could remove the source of pollution far from residential areas or raise the source sufficiently high the diluting effect of the atmosphere could be counted upon to reduce the concentration to acceptable levels.

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[1] Professor, Engineering, Michigan State University, East Lansing.

Today, the presence of multiple sources drastically changes the picture. With multiple sources the wind speed is no longer an effective agent of dilution because the wind carries as much pollution into an area as it carries out. With multiple sources the dilution by the lateral spread of a plume ceases as soon as the plumes intersect. Vertical dilution is limited under all conditions by the extent of the turbulent boundary layer which in Michigan averages about 1500 to 2500 meters in depth and whose top can be clearly observed as a smoke ceiling by airplane passengers. Pollution from distant sources fills the space between the ground and the top of the turbulent boundary layer and can diffuse no more. We therefore can say that the dilution of pollution caused by windspeed, by lateral plume spread and by vertical mixing are all reduced to ineffectiveness by the presence of multiple sources.

In the past it was possible to emit sizable quantities of pollution without offending people in the locality by building high stacks. From the foregoing discussion we can see that although the high stack does reduce the air pollution concentration in its immediate vicinity, it does nothing to alleviate the major air pollution problem at a distance. The only effective controls today therefore are those which reduce the emission at the source.

The multiplicity and diversity of air pollution sources makes their control difficult. Already laws are being enacted in some states to control the emission of exhaust and crankcase effusions from automobiles. Controls on industrial pollution are beginning to be enforced. Eventually pollution from all sources including that from agricultural operations and from private incineration will have to be controlled.

I would like to suggest a rational scheme for enforcing pollution control which would provide people with a timetable and with a predictable estimate of the cost of using atmospheric waste disposal versus the cost of air pollution control. The scheme is as follows:

1. Scale the various pollutants according to their toxicity or nuisance level.

2. Charge those who use atmospheric dispersal a rate depending on the position of their emission on the scale and on the volume emitted.

3. Raise the level of the charge year by year at a preset rate so that offenders can estimate the costs of atmospheric disposal and can plan their pollution control accordingly.

4. Use the money raised to enforce the law, to do research on air pollution and to enhance our natural resources in other areas.

In summary, I would emphasize that the increase in emphysema, of other respiratory diseases and of heart disease, the reduction in visibility and the general reduction in the quality of our surroundings, the damage to vegetation and agricultural crops, the potential poisoning of our food supply and the deterioration of other health and esthetic factors by air pollution make mandatory its control and eventual elimination. We are making a significant start in this direction in Michigan as will be reported by the following speakers, but we must do more. Citizens can play an important role by keeping continual pressure on their legislators to act and to act effectively.

Michigan's Air Pollution Law

Bernard D. Bloomfield[1]

The Michigan Rules and Regulations were designed to cope with the air pollution problem as it exists now and as it may develop in the future. The philosophy is clear-cut. It is an attempt to prevent all new sources of air pollution and to effect control of all existing sources.

There is a long history behind the air pollution control legislation as it has evolved, much of which had to do with those who were in favor of legislation and those who were against it. The form that the legislation has taken has been shaped by the times and undoubtedly what we now have will undergo some change in future years.

The Air Pollution Control Act No. 348 coupled with the Rules serves as the basis for an ambitious control program. A nine member Air Pollution Control Commission appointed by the Governor with the advice and consent of the Senate has policymaking authority and the Health Department has a simple mandate - and that is to get the job done. We are expected to conserve our air resource.

There is additional supporting legislation, the Tax Exemption Act No. 250 and the Solid Wastes Act No. 87. These will be discussed later.

Air pollution is not a new concern of the Health Department. Our occupational health engineers, operating out of eight district offices, have been sampling the air, designing ventilation systems, testing dust collectors and answering nuisance complaints for 20 years as a routine part of their activities. They became involved because they had the training, the equipment and the support of an extensive analytical laboratory facility. If not the best, it is one of the best industrial hygiene activities in the country and starting up an air pollution control section as we have now was not anywhere near the problem it could be where a totally new organization is to be developed. We were knocking on doors, discussing air pollution problems with industry years ago and we are still doing it. The difference is that now we have enforcement authority. But our past efforts have also borne fruit. Several sophisticated and unique air pollution control systems are now in use and several which are now being installed are the result of past efforts based on our recognition of problems which required solutions. In some cases industry asked us about our objectives in anticipation of the new Rules. They purchased and installed equipment on this basis. Communities questioned the quality of their air and we implemented sampling programs to provide answers. We're still doing it. Along with sampling programs, we inventoried pollution loads in terms of amount and type by visiting all industries in several communitywide programs. We're still doing this. We're working on the problem on a day to day basis and we're trying to anticipate the needs of the future.

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[1] Chief, Air Pollution Control Section, Michigan Department of Public Health.

There remain now and probably always will be questions concerning technology, financing, time schedules, performance testing and community involvement. We help where we can through mailings, visits, consultations and, where needed, testing programs.

Permit forms for installation or alteration of equipment, processes and operations which may be a source of air pollution are available. They are simple and they will serve as an important part of our program. The information required for tax exemption under Act No. 250 is essentially the same information we'll need under the permit program. In many cases, duplication of effort will be avoided because the required information will only have to be prepared once. There is obviously much wisdom in reviewing engineering control procedures before money is spent on a project - with the possibility that it may not comply with our requirements, it may be a poor choice of systems, or it may require a disproportionate amount of power and maintenance once placed in use. The permit approach enables such a review.

The local unit of government has an important place in the program. Act 348 doesn't preempt local programming for air pollution control just so long as specific legislation is enacted and the requirments are as restrictive or more restrictive than those of the state. At this time the City of Detroit and Wayne County have enacted such legislation. The Detroit and Wayne County health departments are administering comprehensive programs in close cooperation with the state.

It is expected that permit applications will be submitted to those units of government having specific jurisdiction and which are administering comprehensive programs.

There is an extensive listing of exemptions to the permit system (Rule 31) in the Rules. These pertain mainly to routine operations generally of little air pollution significance. Examples are internal combustion engine use, blacksmith forges, portable brazing and soldering and cold storage refrigeration equipment. The Rules also require that there be compliance with minimum smoke density requirements.

The Ringelmann chart type evaluation is basic to the smoke density requirement; it's over 50 years old; it has been challenged, misused, abused and frowned on because of its lack of sophistication. However, the important point is simply that if a person is not burning efficiently or properly or something is wrong with his equipment, he is causing a neighborhood nuisance and is violating the law. Whether it's a matter of poor maintenance, faulty equipment or the wrong fuel, it's still a problem requiring solution and satisfactory control is expected.

We are now conducting air pollution inventories in several of Michigan's larger cities. Through such programs we will learn about fuel usage, pollutant loadings, specific and unusual problems and the character of control equipment and procedures in use.

The Rules prohibit open burning including open burning for salvage. First a word about just plain burning in the dump, in the open field or on the back property of some industrial establishment. This is generally illegal except where allowed under the provisions of Conservation Department Acts Nos. 143 and 35 as related to forest fire prevention and land management and where permitted under the provisions of the Solid Wastes Disposal Act No. 87. Industry is not permitted to cause a nuisance through the daily burning of a waste heap on its property and the municipality or township is not permitted to conduct open burning operations at dump sites. The answer is disposal of solid wastes through the use of well designed incinerators or in approved sanitary land fills. There are also problems associated with the disposal of flammable liquids and incineration techniques for disposal of these wastes are in use and are being improved upon. Some industries have to dispose of massive quantities of waste materials and operate their own disposal facilities.

The open burning of hulk automobile bodies is a serious problem. It is prohibited except where approval is granted by the local authorities and the Air Pollution Control Commission. Any automobile burning which you see is in violation of the law inasmuch as no one has been granted permission to burn. The junk car is typically stripped of any valuable parts and then piled up and burned. Burning shatters glass, takes the temper out of the steel and burns out oil, grease, tires and combustibles such as cloth fabrics. It also causes severe air pollution problems, on occasion clouding entire portions of communities. The scrap from the automobile is needed. About 60 percent of the new car's engine block and 40 percent of the sheet steel body originates with the scrapped auto. However, uncontrolled burning is not necessary. There are well designed auto burning incinerators which can make available to the scrap steel processor a burned out hulk which can be sheared or otherwise adequately handled. There are fragmentizers which can handle unburned hulks, producing a good quality scrap. And there is still a market for junk automobiles despite comments frequently overheard that they have no value. In several Michigan communities automobile junk yards are now flattening cars in preparation for shipment to a fragmentizing plant with portable hydraulic flatteners. It seems to be working well and perhaps a centralized system of this type, where cars are flattened to facilitate shipment at one central site in an area, is an answer to the problem. In any event, the Health Department is now implementing a program of enforcement and hopefully the open burning of automobiles will soon be a thing of the past.

The Rules approach the total pollution problem but most notably particulate emissions. Rule No. 46 closes what would otherwise be an open end and states that "No person shall cause or permit the emission of an air contaminant or water vapor, including an air contaminant whose emission is not otherwise prohibited by these rules.....which causes or will cause detriment to the safety, health, welfare or comfort of any person, or which causes or will cause damage to property or business." It is likely that the Commission will in the future develop control requirements as pertain to gases, vapors and mists as a next order of business. Much will depend on the action of the Federal government in its required objective (Air Quality Act of 1967) of developing ambient air quality criteria.

The emission schedule for particulates (Table I) is similar to the approach used in Detroit, in Wayne County and more recently by the State of Illinois. The listing of specific operations or processes with specific permissible emission loadings was also part of the initial Air Quality Act of 1967 but industry in general was opposed to national emission standards and this particular provision was removed.

The Michigan emission schedule was developed on the basis of current technology both with regard to the process and control technology. It specifies the degree of control required for coal burning operations according to type of boiler, for incinerators according to size and use, for cement plants including the kiln and material handling operations for the steel mill with a breakdown covering the open hearth, oxygen process and electric furnaces, blast furnaces, and sintering plants, for lime kilns, foundries and iron ore pelletizing operations. There is a further requirement that the coal burning power plant and the cement plant in excess of a certain size discuss emission limits with the Commission. This was included as a provision because coal burning power plants and cement plants present special problems in terms of mass emission loadings and future expansion at certain locations must properly be subjected to a careful review of existing control techniques and those planned for the future. One cement plant emitting 7000 pounds of cement dust per day may not cause neighborhood difficulties. Doubling the plant capacity so that it emits 14,000 pounds per day could conceivably create a problem. Similarly the ground level sulfur dioxide concentrations resulting from coal burning operations may not be excessive in terms of our current understanding. However, a 500 megawatt boiler addition could conceivably create difficulty. The same holds for flyash control in the power plant. Aside from meteorological, topographical and plant design factors (including stack height) it is a fact that electrostatic precipitation type dust collectors now being specified by the utilities are being specified at levels of performance which are more restrictive than the numbers in our Rules. This being the case, with the Commission desirous of seeing the best practical and economically feasible installations being made, there is ample room for discussion of power plant control procedures.

We intend to evaluate all of the coal burning power plants in Michigan, both utility type and industrial. Changes in coal burning are rapidly taking place. Older collection systems are being modernized, some small boilers are being converted to gas, collectors are being installed where none previously existed and the collection systems now being specified for the pulverized coal systems call for efficiencies of 98 percent and greater. Another significant factor is that nuclear fuel type power operation facilities are being constructed in place of coal burning systems.

Foundries do present a special problem. Michigan has the largest number of foundry employees of any state (43,000) and out-produces all states in foundry products (24,000 tons of castings per day). It also has its air pollution problems with foundries. Control equipment for the cupola melting furnace is extremely costly ranging from $50,000 to $1,000,000 per cupola depending upon size and many other factors. There are a few foundries in difficult positions financially and any program implemented by our Division has to be applied to all foundries, almost uniformly and at the same time. This is made necessary because of the competitive aspect of the foundry business. Actually, one cannot just issue an order and expect automatic compliance in this industry. It is a matter of visiting the plants individually, discussing the requirements with management and evolving an acceptable time schedule. All foundries may not be in a position to accomplish satisfactory control at the same time. Each foundry has problems and considerations unto itself, including the business outlook, condition of existing melting equipment, metal production rate and availability of money. While no foundry is to be excluded from the requirements of the Rules, time for compliance could vary.

We have suggested that a two year compliance schedule be established by foundries with three months allocated to the search and decision on equipment and 21 months for installation. We have 291 jobbing and production foundries to be concerned with. Technological changes, to an extent the result of the Rules and Regulations, are being seen in the foundry industry. The high cost of control equipment for the cupola has resulted in a complete re-evaluation of melting systems and in some instances electric arc and induction melting furnaces are being scheduled to replace cupolas. The latter present less difficult and less costly control objectives.

The architect and engineer-designer should be knowledgeable of the Rules and Regulations. It is he who specifies a type of incinerator for the college dormitory, the hospital, the nursing home and the industrial plant. Such specifications must enable compliance with our incinerator performance requirements. It is expected that the incinerator installations now being planned will be measurably better in terms of air pollution control than most of what we have seen until now.

When developing the emission schedule the Commission realized that it could not list a maximum emission limit for every operation. It decided on the use of Table II which indicates permissible emission quantities based on process weight. This table must be used if an operation is not specifically listed in Table I, unless the company enters into discussion with the Health Department so that any appropriate Table I value can be developed. Table II is designed to be restrictive with the aim of stimulating a more extensive development of the Table I emission limits.

I'm sure we are all looking forward to the day when we can say with assurance that air pollution is not a problem in Michigan. This objective will be attained but the time requirement will be dependent to a large extent upon the cooperation of industry, the public-at-large and local units of government. Industry has to make progress, the public has to temper its legitimate demand for clean air with an understanding of the problems and what might appear to be unusually long periods of compliance and there have to be deliberate, well planned programs by local units of government. (And as an aside, I have to say that the public has been most reasonable in attitude and in many instances has been unreasonably subjected to severe difficulties caused by air pollution with little or no recourse.) Well designed zoning ordinances, suited to contiguous land masses which are evolving, must be developed. Much of what we see now is both obviously absurd and unfortunately and unbelievably in some cases the result of some deliberate plan. As well meaning as all concerned parties might be it is an exercise in futility to allow industry and residences to share mutual property lines. There will always be some noise, some dirt and occasionally a characteristic odor. And there will always be people who object to these - regardless of who was there first - the house or the plant. There is need to separate industry, the production hamburger facility, the corner service station, the office building, the parking ramp, the expressway and the home so that one can serve the other rather than to serve but a few and be a cause of distress for others.

In conclusion, I should like to restate a few points:

1. Michigan now has air pollution control legislation which is supplemented by tax exemption and solid waste disposal acts.

The legislation paves the way for an effective and deliberate control program and it is the aim of the Health Department and the Air Pollution Commission to conduct such a program.

2. The Rules and Regulations which became effective on August 15, 1967 will be enforced. It behooves management people, engineers and architects to familiarize themselves with the Rules and to formulate plans for compliance now.

3. The Health Department will provide technical assistance to industry, communities and to individuals to the fullest extent of its ability.

4. Should anyone need information, assistance or advice on any details concerning our program, please communicate with us.

5. The problem is not insurmountable. With the parallel advancement of control technology and our control program (and yours) we are going to see considerable progress in a relatively few years. I believe that clean air will become a way of life with us and that circumstances negating this condition will, in years to come, be unusual and will be considered intolerable.

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

AIR POLLUTION CONTROL PROGRAM

TABLE I

Particulate Matter Emission Schedule

Source		Maximum Allowable Emission at Operating Conditions[a] (lbs. Particulate Per 1,000 lbs. Gas)
A. Fuel Burning Equipment	Capacity Rating in 1000 Lbs. Steam Per Hr.	
1. Pulverized coal (Includes cyclone furnaces)	See Figure 1 for maximum emission values. Note: It is required that a maximum allowable emission listing be applied for to the Air Pollution Control Commission for all pulverized coal (and cyclone) furnaces having capacity ratings in excess of 1 million pounds of steam per hour.	
2. Other modes of firing	0-100	0.65
	100-300	0.65-0.45[b]
	over 300	
	Note: It is required that a maximum allowable emission listing be applied for to the Air Pollution Control Commission for all furnaces in this group having capacity ratings in excess of 300,000 pounds of steam per hour.	
B. Incinerators[c]	Rating in Lbs. Waste Per Hour	
1. Residential apartments	0-200	0.65
	200 and over	0.30
2. Commercial and industrial	0-400	0.65
	400 and over	0.30
3. Municipal	All	0.30
C. Steel Manufacturing		
1. Open hearth furnaces[d]		0.15
2. Basic oxygen furnaces[d]		0.15
3. Electric furnaces[d]		0.15
4. Sintering plants		0.20
5. Blast furnaces		0.15
6. Heating and reheating furnances		0.30

TABLE I (Continued)

D. Ferrous Cupolas(e)	Total Plant Melt Rate in Tons/Hr.	
1. Production	0-10	0.40
	11-20	0.25
	21 and over	0.15
2. Jobbing		0.40

E. Lime Kilns	
1. Rotary	0.20
2. Other	0.20

F. Asphalt (Paving) Batch Plants	Plant Capacity (Tons Per Hour)	
1. Stationary		0.30
2. Portable in remote locations(f)		
	0-100	0.60
	101-150	0.50
	151-200	0.45
	200 and over	0.35

G. Cement Manufacture (Up to 15,000 barrels per day kiln capacity)	
1. Kiln - wet or dry process	0.25
2. Clinker coolers	0.30
3. Grinding, crushing and other material handling	0.15

Note: It is required that a maximum allowable emission listing be applied for to the Air Pollution Control Commission for all kiln installations which will result in a total plant kiln capacity in excess of 15,000 barrels of cement per day.

H. Iron Ore Pelletizing	Gas Flow Rate (SCFM)	
Grate kilns and traveling grates	600,000	0.10
	300,000	0.15
	100,000 or less	0.20

I. Sources Not Specifically Named

The maximum allowable emission of particulate matter from any source except those specified above (Table 1) shall be determined from Table 2, unless a specific emission level for the process is developed and listed by the commission on its own initiative or by application. All new

TABLE I (Continued)

listed values shall be based upon the control results achievable with the application of the best, technically feasible, practical equipment available.

Notes:

(a) Fuel burning and refuse incineration limitations shall be calculated to 50% excess air.

(b) Emission limitations for specific ratings are determined by linear interpolation between the ranges shown.

(c) These emission limitations do not apply to domestic incinerators (defined as having not over 5 cubic feet of storage capacity).

(d) Air cleaning equipment shall be designed for maximum emission of 0.1 pounds per thousand pounds of gas.

(e) Differentiation between jobbing and production foundries:
Cupolas used in a jobbing foundry are the same as those used in a production foundry and will vary in size only according to the quantity of iron melted per hour.
However, the cupolas in a jobbing foundry will be run intermittently for just long enough at 1 time to pour the molds that are ready on the foundry floor, job by job. This might be for a 2 to 4 hour period per day for any number of days per week.
Production foundry cupolas will melt continuously to pour a succession of molds that are constantly being prepared to receive this continuous flow of iron. This could become 8 hours, 16 hours, or 24 hours per day for any number of days per week.

(f) Where no water is available and emission limit of 0.3 pound per 1000 pounds of gas cannot otherwise be satisfied, plant may be located as center point of buffer zone 1 mile in radius having no occupied residences or places of public assembly.

TABLE II

ALLOWABLE RATE OF EMISSION BASED ON PROCESS WEIGHT RATE[a]

Process Weight Rate		Rate of Emission	Process Weight Rate		Rate of Emission
Lb/Hr	Tons/Hr	Lb/Hr	Lb/Hr	Tons/Hr	Lb/Hr
100	0.05	0.55	16,000	8.00	16.5
200	0.10	0.88	18,000	9.00	17.9
400	0.20	1.40	20,000	10.	19.2
600	0.30	1.83	30,000	15.	25.2
800	0.40	2.22	40,000	20.	30.5
1,000	0.50	2.58	50,000	25.	35.4
1,500	0.75	3.38	60,000	30.	40.0
2,000	1.00	4.10	70,000	35.	41.3
2,500	1.25	4.76	80,000	40.	42.5
3,000	1.50	5.38	90,000	45.	43.6
3,500	1.75	5.95	100,000	50.	44.6
4,000	2.00	6.52	120,000	60.	46.3
5,000	2.50	7.58	140,000	70.	47.8
6,000	3.00	8.56	160,000	80.	49.0
7,000	3.50	9.49	200,000	100.	51.2
8,000	4.00	10.4	1,000,000	500.	69.0
9,000	4.50	11.2	2,000,000	1,000.	77.6
10,000	5.00	12.0	6,000,000	3,000.	92.7
12,000	6.00	13.6			

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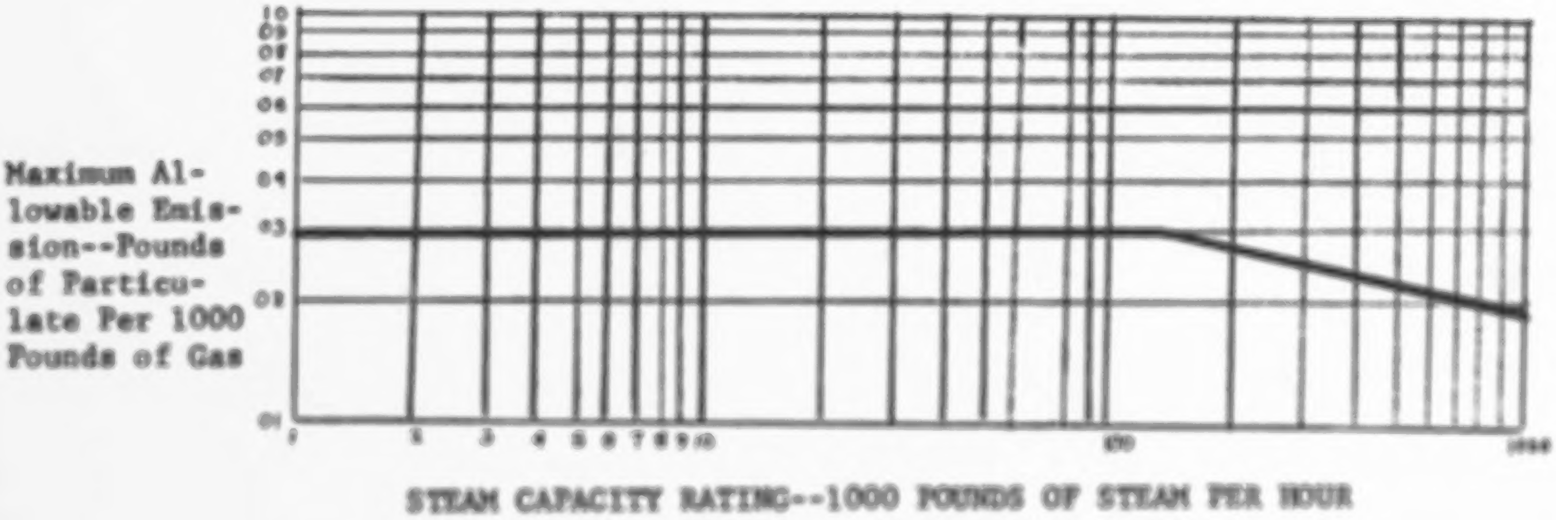
[a] Interpolation of the data in this table for process weight rates up to 60,000 lb/hr shall be accomplished by use of the equation $E = 4.10\ P^{0.67}$ and interpolation and extrapolation of the data for process weight rates in excess of 60,000 lb/hr shall be accomplished by use of the equation $E = 55.0\ P^{0.11} - 40$ where E = rate of emission in lb/hr and P = process weight in tons/hr.

Process weight--The total amount of all material introduced into an industrial operation, including solid fuels, but excluding liquid fuels and gaseous fuels when these are used as fuels and air introduced for purposes of combustion.

Process weight rate--For continuous or long-term operation: The total process weight for the entire period of operation or for a typical portion thereof, divided by the number of hours of such period or portion thereof. For batch operations: The total process weight for a period which covers a complete operation or an integral number of cycles, divided by the hours of actual process operation during such period.

Figure 1



Note: It is required that a maximum allowable emission listing be applied for to the Air Pollution Control Commission for all pulverized coal (and cyclone) furnaces having capacity ratings in excess of 1 million pounds of steam per hour.

Some Results of Air Pollution Control

Morton Sterling[1]

The impact of man on his environment, where air pollution is concerned, can be readily seen by looking out the window, looking at the ring of dirt on one's shirt collar and looking at the crowded wards of respiratory disease patients in the hospitals of our cities.

Man is not by nature a conservationist. Since coming to this wilderness country he has annihilated whole species of animal life, ruined much of our scenic natural beauty, and is in the process of destroying the very air he breathes. To modify an old maxim, he is now in the process of burning the bridge while he is on it.

Conservation is something we associate with the planting of trees and preservation of fishing sites. In the future, we are going to have to start demanding even greater conservation measures for our own environment. For with a great percentage of the population jammed into a relatively small percentage of our land area, the day of man-the-exploiter is past and the day of man-the-conservationist has arrived.

Our conservationist efforts in the field of air pollution must go beyond eliminating the obvious manifestations of air pollution. We must also maintain a sustained attack on pollution in its invisible and more insidious forms. One phenomenon that persistently troubles me is the almost Pavlovian association people make between a dense emission of black smoke and the phrase "air pollution".

Now, I grant you, dense smoke emissions are air pollution and must be eliminated. But, the greater problem, and one which has not gotten across to the people is the danger of protracted exposure to relatively low levels of a variety of contaminants, smoke being only one small part of the spectrum.

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1. Director, Detroit and Wayne County Air Pollution Control Agencies, Detroit and Wayne County Health Department.

One charge of this conference is to examine the gap between what is known about air pollution by the scientific community and what is known by the lay community.

One of the greatest gaps is that the public fails to fully realize that while acute pollution incidents grab headlines, just as daring bank robberies, an equal, if not greater danger lies in sustained exposure to relatively low levels of a mixture of pollutants, which like an embezzler, slowly and steadily drains us of our health and property.

The educational institutions can be of great help in getting across this message, just as they can be of great help in getting across the message that there presently is the technology available to eliminate most air pollutants and that successful and economically acceptable methods have been devised to attack the problem. I would like to relate some experiences and problems of a local official in air pollution control, for I feel these experiences illustrate concepts and methods which are presently employed and from which the layman could benefit.

It is particularly appropriate that this be a 3-state conference since the regional approach has been shown repeatedly to be the most efficacious way of tackling environmental problems.

The Detroit area is just beginning to benefit from a regional approach in the control of air pollution after many years of confined efforts, solely within the artificial boundaries of the City of Detroit.

Eleven years ago I assumed duties as Director of the Detroit Air Pollution Control agency. Often, whatever was accomplished during these early years was mitigated by activities outside the city. Detroit is not surrounded by what is commonly termed bedroom suburbs, but rather industrial suburbs as well. This is particularly true in the southwest, where a panhandle of the city juts out between River Rouge and Dearborn, Michigan. River Rouge is a suburb replete with steel mills, power plants and chemical processing firms. The second area bordering this southwestern section of Detroit, Dearborn, Michigan, contains the Ford River Rouge complex, one of the world's most heavily concentrated industrial areas.

You can imagine the difficulty of achieving any meaningful results in Detroit while the contiguous areas were wholly without control or had only the most nominal emission limitations and resource capabilities.

Fortunately, today, from a jurisdictional standpoint the job is much easier.

Wayne County, in which Detroit is situated, passed air pollution control regulations in 1965, which are compatible with Detroit's present air pollution control code, passed in 1964. Prior to the passage of these two regulations, a joint Directorship of the Detroit and Wayne County Air Pollution Control agencies was created. These moves have done much to facilitate a more effective regional approach to air pollution control in the greater Detroit area.

Governmental entities were conceived to service the people. It would be shameful if these very entities and their artificial boundaries were to be used to provide a disservice to people, as they would if parochial limitations were permitted to frustrate a comprehensive effort to clean the air.

As well as the Wayne County development facilitating a more expansive activity in the Detroit area, two other entities have done much to complement the efforts being made.

The first of these is called the Downriver Air Pollution Control Project, which is a cooperative undertaking of nine suburbs located downriver from Detroit, the Wayne County Health Department and the Federal Government.

Under this Project, the suburbs pooled their funds, contributed them to the Wayne County Health Department, which in turn received matching funds from the Federal Government for the specific purpose of tackling the problems unique to this highly industrialized group of suburbs.

This activity, I'm pleased to say has produced gratifying results, which have accrued to the benefit of Detroit, as well as the downriver suburbs. We have estimated that as much as 40 percent of the pollution in Detroit emanates from outside the city.

The second activity peculiar to the Detroit area is one which is responding to the unique locale of Detroit. We are situated on an international boundary, across the Detroit River from Windsor, Ontario. The transboundary pollution flow has long been a problem to residents of both Michigan and Ontario. I might add, that it's not unreasonable to say that the United States side of the river has been a bit more offensive than the Canadian side.

A treaty organization called the International Joint Commission has initiated a study of the pollution sources on each side of the boundary. This effort is manned by personnel from the respective nations and supported in part by local control personnel. This study was requested by Ontario officials who felt that insufficient attention was being given to controlling air pollution in the Downriver area. This request preceded by several years the enactment of Wayne County air pollution control regulations, and due to international considerations was not withdrawn after the passage of the county requirements. When this study is completed, the study teams will make recommendations to the two federal governments which will then make recommendations to the local areas toward ameliorating the problem.

Fortunately, accelerated local control activities which were mentioned earlier will mean that much work will be well under way, or completed prior to issuance of the International Joint Commission recommendations.

The foregoing accounts demonstrate that the solution of air pollution can best be achieved on a regional basis.

Also implicit is the fact that a great amount of intergovernmental cooperation is necessary to combat the problem of air pollution in a particular locale. The control of air pollution in the Detroit area involves a unique international situation, an unusual suburban situation plus an interdependent city and county control effort. The needs of that area may be approximated elsewhere but never duplicated.

In conclusion, I feel that strong intergovernmental cooperation is necessary to achieve progress. Government must not permit artificial geographical boundaries to stand as an obstruction to progress, nor must any one governmental level feel that it, to the exclusion of other governmental levels can solve its problem.

These messages hold true for air pollution control. What holds true for environmental conservation as a whole is that an unrelenting effort to protect our air, water and land must be maintained. In the last decade much has been done to rectify the exploitation of our resources. We must never, through our accomplishments, feel the job is completed and relax our commitment.

In short, the message that can best be delivered from this conference is that we now live, and will continue to live in the future, in an age when man is and must be, man-the-conservationist.

The Gap Between Science and the Citizen

Chairman Mrs. Donald E. Clusen
League of Women Voters, Washington, D. C.

The Conservation Foundation
Dr. Richard Pardo, Associate
The Conservation Foundation
Washington, D. C.

The Gap Between Science and The Citizen
Dr. L. T. Wallace, Professor
University of California, Berkeley

The Conservation Foundation

Dr. Richard D. Pardo[1]

My role this evening is both pleasant and easy. First, speaking for The Conservation Foundation: thank you for your presence at this conference. Your being here is significant not only for the future environment of the Upper Great Lakes Region, but for other areas of the country as well. As you may be aware, this is one of the first of a series of such conferences to be held throughout the country. This effort will serve as a foundation on which other regional meetings will build.

As professional conservationists are prone to do whenever confronted with an audience, I am going to turn to the pages of Henry David Thoreau's Journal for an apropos observation of that naturalist-philosopher: "Our school districts," he wrote, "are, as it were but infant schools, and we have no system for the education of the great mass who are grown up."

Your presence here is proof that the situation Thoreau complained of no longer exists. Even so, I suspect he would be just as concerned today about the job that needs to be done in adult education, especially in his prime area of interest: man's interdependence with nature.

Today's pressing environmental problems are often controversial, frequently emotional, usually technical and complex, and commonly abstract. To create a real understanding of environmental issues in our vast, mobile, ever-changing, fast-growing society may require nothing less than a miracle. It will certainly require dedication, inspiration and innovation. It is as immense and challenging a task as the academic world has ever faced, befitting the application of the best minds and most advanced facilities of the educational community.

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[1] Associate, The Conservation Foundation, Washington, D. C.

Herein lies the purpose of the conference; to explore ways in which the colleges and universities can apply their resources at the community, regional, state and national level toward meeting this challenge of maintaining a livable environment for all.

Those of us at The Conservation Foundation see our role in this effort as that of a catalyst. The Conservation Foundation is a small, non-profit, privately financed organization with a deep involvement in research, education and information in environmental conservation. In this position we are, like those of you in the academic world, better able to play an objective role; a happy situation that allows us to be useful to a degree far out of proportion to our size.

I must confess that we have been tardy in awakening to the role of the colleges and universities in this area of community conservation services. Title I of the higher education act of 1965 first brought us into the area, and we were not long in discovering that much was also going on in general and cooperative extension. In May 1967 we sponsored a national conference on Title I and conservation. Copies of the report of that conference are available if you have not already received one. This Green Bay conference, and others that will follow are an expanded outgrowth of that initial meeting, and we are gratified that we have been able to play a part in it. Our thanks to those who have worked so hard in planning and preparing the conference, and to all of you in attendance, for being here and for the continuing efforts you will make in the weeks and months ahead. We will continue to work with you to our fullest capacity.

The Gap Between Science and the Citizen

Dr. L. T. Wallace[1]

Conservation and depletion have often been put in polar positions when discussing renewable and nonrenewable resources. These concepts have been related to the deteriorating quality of our resources and environment. I would like to shelve these polar positions tonight and talk about these concepts in terms of "rate of resource use."

The main question we have to be concerned about, then, is the threshold of resource use which might lead to irreversible consequences. There are many examples which could illustrate this point. In wilderness areas protected from human encroachment--and also protected from fire--the wilderness area quickly becomes something other than what it was when first set aside. The Sierra Club has many photographs illustrating the rapid spread of brush and scrub into grassy ridge lands and valleys. The salmon fisheries are another example of resource use (exploitation) which might lead to the extinction of salmon.

In addition to the renewable and nonrenewable resources already mentioned, I would add a third classification--institutional resources. Institutions may be defined as the social controls which groups developed to regulate the actions of other groups and individuals. Public education, marriage customs and inheritance are illustrations of institutions developed in most societies. How do we relate the institution of education in this country to the rate of resource use? Although we have to begin where we are now, technologically and sociologically, time is of the essence to learn not only how to use resources and understand the technology involved in their use: Who pays, who benefits, at what location and when?

I would like to set out three points as a framework for an educational thrust by all organizations and agencies interested in conservation and resource use: the Land-Grant system, private institutions, public, two-year and trade schools, programs developed by unions, and any other type of educational effort developed by any other interested agency, individual or group.

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[1] Economist, California Agricultural Extension Service and the Giannini Foundation, University of California, Berkeley.

First, I would hypothesize that as a society, we have not yet crystallized resource goals which are acceptable to the masses-at-large. We have not accounted for the differentials in taste and preference, in awareness, in knowledge and understanding. If resource goals have not been generally agreed upon as yet, one of the questions we must ask ourselves is: Can we, or how long can we, afford to wait for unanimity or overall consensus? If we wait too long, some resources will be used up--we will pass the threshold which leads irreversibly to issues of pollution and other types of resource exploitation.

Secondly, it follows that if the goals are not held in common, the problems to be worked on are not going to be clear in the minds of the public; nor is their priority of urgency, or magnitude of significance going to be held in common. As a result of this dilemma, we have the spectacle of many educational efforts seeming like the man sitting on a horse going in all directions at once. We have an across-the-board, evenly distributed (except for sporadic political pressures) effort on improving water quality, land use, air pollution, transportation boggles, salt water intrusion, drainage, redwood parks and the coastal flyways. Are all these items of equal value to society, and should they all be treated with equal effort?

Thirdly, compounding the confusion that comes from differential goal priorities and problem priorities, many of the "solutions" we have put up to control the resource-use rates affecting our environmental quality problems have a devil of a time being politically accepted and implemented. It takes an Internal Revenue Service and Sierra Club fighting about Grand Canyon or a redwood park to inflame, inform and unite the public to stop actions leading to irreversible consequences--or enact measures which will insure a "proper" rate of resource use (including quality aspects), so that future generations may enjoy our generation's resources and find their own solutions to resource-use problems of their times. I sincerely doubt that the questions and problems pertaining to resource use will be much different 100 years from now. However, the answers will be different. Answers are offered and accepted on a continuum of quality and performance, and the criteria of acceptability will vary with the resources and the social values paramount in those times.

What, then, is the role of the scientist to the citizen, and the citizen to the scientist? I believe one pole of the communication center lies in the heart of our educational system which I shall call, for want of a better collective term, the university. The other pole lies with people who send their children to, and attend themselves, the various kinds of places of higher learning throughout the nation and the world. The university, and all other types of educational efforts I have included under this umbrella, is central to our national life. Over one-third of all advanced degrees held by social and physical scientists are contained in our nation's universities. These people are crucial for the transmittal of knowledge from one generation to another and in the application of knowledge to problems of modern society. The rule thus becomes a joint responsibility of the scientist and the layman to acquire knowledge through research and the analysis of changes that might occur in our "world." It also becomes their joint responsibility for the transmission, or teaching, of this knowledge, and in its preparation for public service and use.

This two-way communication is essential to identify and classify meaningful problems, and to select the relevant knowledge to aid in forming solutions. An example of how knowledge and communication are necessary can be found if I say quality is a problem. It helps if I say water quality is a problem; but, then, some fellow in the back row will say, "But we do not need all water the same quality." Quality needs will vary with the purpose of the water. We do not need the same quality for industrial cooling, for drinking and eating purposes, for recreation, for fishing or for irrigating.

In Arizona, the plumbing industry has developed an enclosed toilet system on a water system separate from other house uses. This system is given an initial injection of water which is circulated and recirculated through a series of filters. It saves thousands of gallons of water a year (home owners can even select what color they want this water to be from among several--turquoise blue, emerald green, etc.).

Before a university can be useful, a society must put it to use. Franklin and Jefferson were advocates of public service and the involvement of scientists by citizens. The Morrill Act of 1862 manifested this public service through education with the Land-Grant system. It is the dynamic interrelationship of the acquisition of knowledge, and its transmission for public service, that allows a mutual benefit to be obtained from private pursuit and public purpose. Very few universities and educational efforts can be all things to all people. Universities have to select those areas in which they can excel. However, expert advice can be found most frequently, and in more diversity, in our educational system than in any other single facet of our total political-social economy. The unique contribution of our educational system is knowledge, not operating skills. It is identification, not assistance. The operating skills and assistance are more often provided by government at all levels and our private economic sector. However, it is up to the university to help perfect the transmission of this knowledge for public service through government and the private businesses to bring analysis to problems of our society.

The educational leadership and the institutional leadership must harmonize within the university, within the community, and between the university and the community. The university is not self-sufficient anymore--if it ever was. It needs the support, interest and collaboration of all citizens. Specialization breeds and demands coordination. A relevant exchange of ideas, points of view and information become increasingly essential for successful problem solving.

With differences in goals, problem identification and priorities, and the most feasible short-run and long-run solutions, we do have a communication and value gap between the scientists and today's average John Doe citizen. These differences can lead to basic conflicts, and possibly to an arrogance of virtue, as well as the potential of compromise and understanding. We must use the resources at hand (one of which is the university as a knowledge center) to help resolve these differences. We now have an opportunity to choose how we want to control our future and its environment. We must have the grit to embark on implementing this choice.

Environmental Issues in Plant and Industry Location

Minnesota Panel

Moderator Dr. LaVern A. Freeh, Head
Agricultural Short Courses
University of Minnesota

Aesthetic Considerations - What and How
Mr. Donald Brauer, Brauer & Associates, Inc.
Minneapolis

Effects of Concentrated Human Habitation and Industry Use on Water
Dr. Calvin Fremling, Biology Department
Winona State College, Winona

The Electric Industry - A Search for Criteria
Roland W. Comstock, Manager, Lands and Rights-of-Way, Northern States Power Company
Minneapolis

Natural Resource Based Industries
Mr. William MacConnachie, Jr., Vice President
Northwest Paper Company, Cloquet

Public Natural Resource Administration
Mr. Robert Herbst, Deputy Commissioner
Minnesota Department of Conservation
St. Paul

Aesthetic Considerations - What and How

Donald G. Brauer, P.E.[1]

"What"

Ugliness and desecration were not the purposes of the builders of America, but they are the obvious and logical results of the frontier ethic. . .use one place long enough to mess it up, then move on to another place!

> The United States "is a vastly ugly place in which to live - - noise, littered streets, vandalism beyond belief, forests of ugly telegraph poles and wires, befouled streams, polluted air, decrepit mass-transit systems, a countryside devoured by monotonous new suburban housing, graceless merchandise barns and hidious drive-in establishments. . .cities which are sprawling waste-lands..."
>
> (from "Redoing America;" by Edmund K. Faltermeyer)

The fact that most Americans are totally unaware of the "vast ugliness" around them is more appalling than the ugliness itself! We have demonstrated that the human species has (thus far at least) an amazing capacity for adapting to an environment hostile to every sense... sight, sound, smell, feel. Unlike the hostility of nature from which man found, and made, escapes, these man-made, seemingly ubiquitous nuisances, intrude on our senses incessantly, so that man, the "shaper" is himself being shaped in as yet unknown ways. "Aesthetic education" of the masses is not only a practical impossibility, but is a needless detour from the primary immediate objective - instilling an "aesthetic ethic" among those who actually make the decisions and invest the money in building and rebuilding urban America. The best "education" for aesthetics is awareness, meaningful perception of quality in every element of environment.

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[1] President, Brauer & Associates, Inc., Edina, Minnesota

If an "aesthetic ethic" is to have any meaningful application in the building process, it must have at least equal footing with the economic motives basic to a free enterprise system. Economic incentives are not new to the development process, but incentives for aesthetic considerations are few and, thus far, ineffective. Economic incentives can be effective, and must be if we are to change the course of events in this country.

"How"

The trend away from property tax as a primary source of revenue for local government offers the opportunity to be deliberate about the location of industry between communities as well as within each community.

In Minnesota municipalities within the last ten years, the proportion of non-real estate tax revenues has grown from 5 percent to nearly 50 percent. This represents not only an increase in state and federal aids of many kinds, but a trend toward fees and charges for various identifiable services rather than a total dependence upon property tax sources. School districts have been receiving close to 50 percent of their income from non-property tax sources for many years. The old cry - "we need the tax base" has carried many a poor zoning petition to approval. It should be less effective in the future. Business and industry should know better than anyone today, the economic effects of the "leisure age". Quality and qualitative factors are fast replacing quantity as primary elements in consumer decision making today. However, more often than not we have learned how to corner the quality market without offering real quality; this is particularly evident in the structure of our urban environment.

Some specific directions to industry

1. The "Aesthetic and Environmental Ethic" must enter the development process at the earliest and highest management level. Even the most effective application of a valid ethic at the facility design level can produce few positive values - merely "aesthetic cosmetics" to hide the worst and emphasize the mediocre. Perception, and sensitivity at the highest level is more important than skill and artistic talent at every other level.

2. Site selection is the most important step in the location-development procedure. Industry must accept a large share of the responsibility for developing, and then being consistent with logical land-

use plans for regions and communities. Will the industrial and business communities analyze regional, metropolitan and local land-use plans and provide sound, attainable alternatives to the typical bureaucratic plans proliferating every day, or will they sit back and complain, and continue to pick the plan to pieces in separate, self-serving ways? --a most effective means of destroying the foundations of planning.

3. Evaluation of the environmental assets of an area and a site must precede site design. The typical "prepared industrial site" has no natural assets. It has been leveled - well, almost leveled to just enough slope to drain, but even this bleak site might have a hidden dimension, some potential for environmental character if given a chance. Some industries are developing hundreds, if not thousands, of acres of rich natural environmental resources, without so much as one minute of informed, intelligent, professional environmental evaluation or advice.

4. Prepare at least one alternative site development scheme based upon the preservation and utilization of the significant natural resources of the site. Would you, today, give equal consideration to the environmental-based plan against the engineering department's plan? Engineering is dedicated to the conquest of natural forces and resources, and not true preservation, development and interpretation.

5. Begin immediately an extensive program of interpretation of natural and constructed environmental assets to all personnel involved in the development process. Man today is nearly totally ignorant of aesthetics. We look, but do not see; listen, but do not hear; touch, but do not feel. Interpretation is expected today. Few things are merely presented, or if they are, they are largely ignored. If aesthetics and concern for our environment are to exist, a concern must be marketed at least as effectively as tobacco products.

In this country, we stand near, perhaps on, the threshold of being shaped by our own aesthetic filth, physically, mentally, and morally. The most unfortunate part of that possibility is that man can probably acclimate himself to that, and even more filth, without being destroyed. Or can he?

Effects of Concentrated Human Habitation and Industry Use on Water

Dr. Calvin R. Fremling[1]

Renewable resources are rapidly being displaced in densely populated areas by asphalt, concrete and the cultivated greenery associated with urban sprawl. Most city dwellers have apparently learned to live without grassland, forests, natural beauty and wildlife, but in many cities Americans are beginning to suffer for want of two other renewable resources--clean air and pure water. Unfortunately, the pollutants produced by the people and the industry of a large city affect not only the inhabitants of that city, but also those upstream, downstream and downwind--directly or indirectly. The subject of air pollution has been covered well by the Michigan panel, therefore I shall not attempt to discuss it further. Rather, I will discuss very briefly, how concentrated human habitation and plant location affect water quality and water supply. I shall cite the effect of Metropolitan Minneapolis and St. Paul upon the Mississippi River as an example, even though the problems there are small compared to those of larger cities such as New York City, Chicago and St. Louis.

The seven-county area surrounding the Twin Cities contains over one-third of Minnesota's population; and the population of the seven-county area is expected to double in the next 30 years.

Within the metropolitan area, the Mississippi River is joined by the Minnesota River and the St. Croix River. Minneapolis and St. Paul depend upon the Mississippi River for almost their total water supply, but the suburbs use ground water. It is already apparent that ground water supplies will soon be insufficient, and it will be necessary for the suburbs also to take water from the Mississippi River. By 1980, according to Minnesota Conservation Department estimates, the flow of the Mississippi River in the Twin Cities area must somehow be increased to meet the requirements of the public, navigation and industry. The most obvious source of augmentation water is the lake region of northern

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[1] Professor, Biology Department, Winona State College, Winona, Minnesota.

Minnesota. Thus, if lake levels in the resort area are dropped periodically, the residents upstream will feel the influence of the downstream population center.

Industrial wastes, partially treated sanitary sewage, and raw sewage from overloaded combined sewers have completely fouled the Mississippi River for 21 miles downstream to Lock and Dam No. 2 at Hastings. Game fish have been virtually eliminated from this zone, and even commercial fishing is not practiced above Lock and Dam No. 2. Although burrowing mayflies are abundant enough downstream, in less polluted areas, to occasionally cause navigation problems and to block bridges, they are absent from Hastings to St. Paul. Pollutants which have a high biochemical oxygen demand have erradicated the mayflies and other sensitive bottom fauna in that area by depleting the dissolved oxygen at the mud-water interface.

The bulk of the pollutants which defile the area have come from the Minneapolis-St. Paul Sanitary District Sewage Treatment Plant, which until very recently had only primary treatment. The plant initiated secondary treatment last summer and in compliance with recently established water quality standards will, hopefully within 5 years, be operating at a level of 90 percent biochemical oxygen demand (BOD).

Economy-minded suburban municipalities upstream from Minneapolis and St. Paul are now seeking to establish their own treatment plants rather than connect with the remote MSSD facility. Twin City residents fear that effluent from the plants, if discharged above St. Anthony Falls, will threaten their water supply during drought periods.

High coliform counts indicate that the river is presently unsafe for water contact sports for another 20 miles below Lock and Dam No. 2. Water dependent recreational activities in the cities of Hastings and Red Wing are curtailed because these cities lie in the recovery zone of the river. Navigation dams, although not designed for that purpose, apparently prevent the river from being severely polluted even farther downstream. The river below the Twin Cities is formed by the dams into a series of pools, each of which serves as a sewage lagoon. Each dam subsequently serves as a minor aeration facility. Lake Pepin, sadly, serves as a settling basin for fine particulate matter. By the time river water leaves Lake Pepin it is surprisingly clean.

The Lake Pepin area and the area downstream are very beautiful. Fishing is at least as good there as it is in northern Minnesota or Wisconsin. Yet, the area is hardly utilized by tourists because of the pollution stigma. The economic growth of a large segment of two states is thus curtailed by the metropolitan complex upstream.

Nutrients from upstream sewage cause increased eutrophication of the river. Because of increased quantities of algae, the carrying capacity of the downstream area for fish and other aquatic life is also increased. Eutrophication, however, also causes increased sedimentation behind navigation dams thus reducing their water storage capacity and causing the bottom of the river to rise. It is conceivable that the elevation of the river bottom will increase the severity of spring floods, in flood plain cities, especially when run-off is facilitated by urbanization and highway construction within the watershed.

Large power plants in the area use great volumes of water for cooling purposes and they thermally pollute the river. The thermal pollution is not yet harmful, in my opinion, but it could be in the future. It is unfortunate that industries which produce heated water are not built in conjunction with sewage treatment plants so that the heated water could be used to speed the bacterial decomposition of high BOD sewage--especially during the winter months.

It is ironic that residents of the metropolitan area have expressed great concern over minute amounts of radioactive materials and large amounts of heated water which are to be added to the river by the Northern State Power plant upstream at Monticello. Like most river residents they express little concern, however, about what their own sewage is doing to the river and to the people downstream.

The Electric Industry - A Search for Criteria

R. W. Comstock[1]

I am faced with a difficult task today. I appear before you as a representative of an industry which perhaps more than any other in recent times has been reviled in the harshest terms as a wanton despoiler of our environment. In the minds of man, we wear only black hats. My goal is to suggest that perhaps the hat--at worst--is only gray and that perhaps there even are patches of white beginning to appear. That is a formidable task under any circumstances and it must be done in the eight minutes allotted. I will under these circumstances avoid a "nuts and bolts" approach, leaving details to later questions. Rather, let's paint the scene with a broader brush.

To understate, it is obvious that the electric industry and the formidable forces of conservation and natural beauty are in a bind. The industry nation-wide is faced with an inexorable and accelerating hunger for electric energy. It cannot be abated or denied. Yet, when we set out to expand service or to maintain its effectiveness, we often encounter severe public criticism, delays and significant incremental expense, all in the name of environment. Why? Is there an acceptable course which the industry can chart? Is there common ground upon which genuine dialogue can be founded? The answer cannot be "no"--it must be "yes!" Your task and mine must be to find that consensus.

I suggest to you that in substantial measure the problem arises because public opinion has within not more than the last five years changed the rules without prior notice--and the industry has been caught short. Two or three decades ago, the importance of environment in general was something that people read about in the works of Emerson and Thoreau. It was delightful and inspirational and intellectually rewarding, but no more than that. Urban parents dreamed of cool forests and rippling brooks, but they sat around in hot cities. Rural parents cursed

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1. Manager, Lands and Rights-of-Way, Northern States Power Company, Minneapolis, Minnesota.

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the forces of nature for making their lives difficult, and had little taste for the appreciation of natural beauty. A tree was something to cut down; a marsh was something to fill in. We spun a web of high voltage lines over the countryside and the economy bloomed. And nobody cared.

Now, there is a growing consciousness about the importance of our environment and this is rapidly becoming a national guilt complex about what we have done to it. Our affluent society has begun to worry about the price it paid to get there. It was inevitable of course that industry would be swept up into this maelstrom, because, by common consent, industry had become a major offender of the new code even before there was a new code.

There is, as I view it, one central problem at the root of all environmental concern with which at least the electric industry is struggling--the old rules of the game have changed but the new rules are not yet developed. What's worse, there are at least four separate and distinct umpires refereeing the game: the rate payer, the shareholder, the regulatory commission, and the general public. We must serve four masters, each of whom often has a different viewpoint.

So, somebody must answer some pertinent questions:

1. Is burying power lines a legitimate expense? And if so, to whom is it a legitimate expense?

2. Where should transmission lines be located--near the Interstate Highways or other major roads or away from them? Should the lines be clustered in corridors or separated and dispersed? Should there be multiple use corridors? Should transmission lines be out in the open flat land or should they be tucked away in the hills but where substantial numbers of trees must be cut?

3. How should the supporting structures for transmission lines look? What are the criteria for an acceptable design? Should we use wood or composite laminations or prestressed concrete or steel? What are the criteria for river and stream crossings?

4. What are the effects of thermal pollution? Of SO_2? Of radiacides? Who decides?

5. Will our customers agree that the costs of preservation of natural beauty are worth it? I am sure it comes as no surprise when I say that not all people are as concerned and as enlightened as the group to which I am now speaking.

I dare say that no one in this audience--a dangerous challenge--can with any certainty of genuine consensus answer any one of these questions. Thus, the really difficult dilemma for all of us collectively is that society is demanding answers right now to these and related questions. Yet, there is no source (save ourselves) to whom we can turn at the present time for a consensus on answers. Our task--indeed our opportunity--is to help shape those very answers. If a consensus is ever to occur, I am convinced it will be because we have collectively acted persuasively, constructively and responsibly. If we fail, the answers will still be supplied but we will be deprived of the opportunity to share in their formulation. Present indications are that there is yet time for us in the Midwest to act. If that is not true then all of us in this room are wasting a lot of time.

Now--have I really told you anything about "Electric Generation and Transmission--Site and Route Selection Criteria?" Of course not--that is precisely the point. No longer are the old criteria valid. They have been abandoned to a greater extent than most of you realize. The new criteria are yet to be shaped. Any such creative effort is painful and halting. Speaking for my own Company and myself, I say we share with you a deep and genuine willingness to search for that consensus.

Natural Resource Based Industries - Their Contribution to the Economy

W. M. MacConnachie, Jr.[1]

Introduction

The natural resource based industries I plan to discuss this morning are the top three economic bulwarks of Northern Minnesota.

Iron Mining-a $460M business
Forest Products-a $325M business
Tourism-a $40M business

It is significant that these same industries rank second, third, and fourth behind agriculture, in the state's economy.

It is perhaps self evident that the natural resource based industries are the basic industries of any state or area upon which manufacturing and services must rely.

It is also axiomatic that these basic industries are inexorably tied to their natural resource with little or no flexibility of location. Thus the iron mining industry is concentrated along a ribbon area 110 miles long and only 3 miles wide; the forest products plants are found near or in forested areas where water, power and labor are economical; and tourism is where the lakes and forests create high esthetic and recreation values.

Problems

It seems to me, the critical question before this panel and audience is whether these basic, natural resource based industries are consumptive and deleterious to our environment, or permanent and beneficial. Who is the judge?

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[1] Vice President, Northwest Paper Company, Cloquet, Minnesota.

This question of "who is to judge" is of paramount importance, inasmuch as qualitative decisions in every sphere of life are far from definitive or agreeable. Certainly we might expect quite a differing opinion as to the environmental quality of a mining town on the part of a visiting Twin City dentist or college professor, and a proud iron range mayor, or mine worker, or state swimming or hockey championship team! In like manner we can find the city critics of timber harvesting on opposite sides of the opinion poll from woodsworkers who love the freedom of the outdoors, the whine of the saw and unique smell of balsam or freshly sawn pine lumber, or the deer hunter using logging roads to shoot his buck nibbling on young shoots in cut-over areas.

Then what does the situation seem to be as far as the significant effect of these industries on environmental qualities?

Having supplied as much as 90 percent of the world's iron ore needs-especially during World War I and World War II--our iron range at nearly 100 years of age is still a bustling economic asset to our state and nation. Its excavations and overburden mounds are tourist attractions. An underground mine is now a popular state park. Its schools, churches, and parks are among the best in our state. Perhaps the outstanding feature of this industry is the recognition that mining is sadly exploitive--that someday an end will come. By establishing the Iron Range Resources Rehabilitation Commission and Fund more than 20 years ago, the State Legislature, with industry support, is constantly exploring and researching ways and means of bridging the gap when ores run out. Thus a new process to beneficiate low grade taconite ores has revitalized the entire range economy.

In a comparable way, the mature old growth forests which provided the lumber to build homes, schools, churches, factories throughout the entire Midwest, have been replaced with vigorous second growth forests capable of sustaining a giant pulp and paper industry. As the cycle of maturity re-occurs, the sawmills which have never entirely disappeared, will once again be prevalent. No finer communities exist than those in Cloquet, Grand Rapids, or Brainerd, Minnesota; each can be called a city of wood industries.

Mention need only be made of the highly considered environmental qualities of the Boundary Waters Canoe Area and proposed Voyageurs National Park in Northern Minnesota to establish the fact that tourism continues to flourish because the area is attractive in spite of nearly 100 years of so-called exploitation. Obviously both of the above areas have endured timber harvesting and commercial forest management.

Conclusions

In thinking through this subject I can't help but recall the obvious requirements for every successful natural resource based industry:

- -a renewable, regenerative, or replacement resource through wise management or utilization research and development.
- -sustained water and power supplies in abundance.
- -labor attracted to good, steady jobs in fine plants, with excellent cultural and recreation facilities and opportunities.

It is my observation that enlightened owners and managers of industry who personally enjoy life's finer qualities will carry these feelings to their work environment. Similarly, employees who are motivated to appreciate a quality environment, will determine that it is achieved. I have been greatly impressed with recent trends toward the education of youth in the humanities and I sincerely believe this approach is the only one with a lasting effect.

Public Natural Resource Administration

Robert L. Herbst[1]

American citizens have a vested interest in a considerable amount of real estate. The federal government owns over one-third of the land area of the United States (770 million acres). Add to this the public ownership of various states, counties and municipalities and our public acreage is certainly impressive.

Public lands contain a substantial amount of the nation's natural resources - timber, minerals, water, game, fish, grazing lands and scenic areas. Natural resources are the foundation of our economy and provide us with considerable outdoor recreation. The manner in which we develop, protect and use these resources is extremely important. The well-being of citizens and our standard of living are directly involved.

To put it bluntly: Our standard of living can be no higher than the standard of our natural resources.

Natural resources are, for the most part, on the decrease. Add to this factor an expanding population, modern means of transportation, increasing income, leisure time, and development of new natural resource uses. It is obvious that the demands on our basic resources are accelerating at an alarming rate.

The competition of conflicting demands on our public lands is also evident. The inherent controversy in public land use is illustrated in Minnesota's Boundary Waters Canoe Area, in our proposed Voyageurs National Park; in the California Redwoods, the Cascades, the Allagash, the wild rivers; by the timber industries' need for increased supplies for the future; by the mounting pressure occasioned by water use, new mineral discoveries and space technology.

The interest in public lands is intense, the demands for their use heavy and accelerating, and the need for a proper balance of use and ownership critical.

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[1] Deputy Commissioner, Minnesota Department of Conservation, St. Paul, Minnesota.

As you are aware, many governmental agencies have natural resource management responsibilities. Please indulge me while I relate some of these responsibilities to a personalized example -- the Minnesota Department of Conservation.

The Minnesota Department of Conservation is charged with the responsibility of caring for much of Minnesota's natural resource heritage. Our personnel are dedicated to a professional obligation - one which benefits our citizens and visitors alike.

To summarize quickly we are responsible for the

-Fire protection of 17 million acres;
-Management of 6 million acres of state-owned land under our jurisdiction (this includes state parks, state forests and wildlife management units);
-Administration and leasing of the state's mineral ownership of over 5 million acres;
-Management and regulation of harvesting the game and fish resources of Minnesota;
-Many facets of public waters, including the management of over 15,000 lakes, 25,000 miles of streams and ground water;
-Operation of many facilities including over 350 dams, 3 large forest nurseries, 18 fish hatcheries, research laboratories, fish rearing ponds, etc.;
-And many cooperative programs, such as assistance to private landowners on forest management.

In brief, the Minnesota Department of Conservation is charged with the responsibility for directing complex, demanding resource programs of increasing benefits to our citizens. To carry out these programs, we are organized into 5 major divisions: 1) Game and Fish; 2) Lands and Forestry; 3) Parks and Recreation; 4) Waters, Soils and Minerals; 5) Enforcement and Field Service.

The divisions, for the most part, represent natural resources, or uses of resources. I feel that it is important to note that all natural resource areas are vested within one department. Obviously, since resources are related one to another, so must their management be related.

We are a proud department with a proud history. Over the years, we feel we have made significant contributions to the betterment of our people and resources. Problems? Of course there are problems. We face new and increasing threats to our natural resources. We have communication gaps between the general citizenry and the Department. Who has said: Conservation, thy name is controversy!

I would like to touch on some of these problem areas. And I know you will identify the symptoms as common to many of the afflictions in your own areas:

- -Litter and unsightliness on our landscape have reached the point of being a national disgrace. One family is responsible. We call it the "Ness" family. Careless-ness / selfish-ness / and malicious-ness.
- -The scatter-gun pattern of land ownership has created a number of challenges. In most cases, scattered, small tracts of land are far more costly to management than are consolidated lands.
- -The separation of surface ownership from the mineral rights has further complicated the development of resources. We are intimately familiar with this problem in Minnesota.
- -Increased and varied use activities on many lakes dramatize the need for zoning systems.
- -The over-development of lake shores affecting aesthetics, fish production, water quality, etc. again emphasizes the zoning need. In Minnesota, all lakeshore homes are on 14 percent of the lakes. But, at the present rate, prime lakeshore in north-central Minnesota will be saturated with development by the middle 1970's.
- -The multiple use concept of forest management is practical and desirable in many areas of Minnesota. However, we need to make multiple use more functional by directing additional management efforts toward increased production of secondary benefits and products.
- -New recreational developments have raised serious new challenges for resource management. For example, the snowmobile marks the advent of machinery that can travel almost anywhere in winter months.
- -Minnesota has not been mapped adequately from a geological standpoint. Without mapping, we cannot evaluate our potential properly. I would remind you that a mineral deposit can be mined only where it exists. Any other land use that seems in direct conflict with mining usually is relegated to alternatives in site relocation. This basic fact must be kept in mind when public land managers consider the establishment of land uses to the exclusion of mineral development.
- -A rural society is changing to an urban society. The result: our new generation has little "tie" with the land. Many of our young people have had no genuine outdoor experience. Thousands of youngsters have never gone hunting or fishing. They are remote from the land -- fenced in by freeways.

We are confronted by controversies over natural resources decisions most of the time. To illustrate, here is a sample of some current controversies in Minnesota. Underground storage of gas, a proposed national park, mining possibilities in the Boundary Waters Canoe Area, abandonment of power dams, removal of deer from an arsenal, the harvest of wild rice, the wild rivers bill, public access program, mining restoration, low pheasant population, bounties, trawler use, fish populations, power lines, moose hunting, game and fish financing, snowmobile use, federal vs. state jurisdiction over wildlife, various pollution matters, farmer/hunter relationships, new state parks. So it goes. No two problems are alike, anymore than two people are exactly alike. And conservation problems are people problems.

I would conclude that the resource management challenges confronting us are, in a very real sense, frightening to contemplate. We cannot afford a selfish, narrow field of vision. We simply cannot afford to be wrong. It is my conviction that the future of humanity itself is at stake.

In summary, I would cite for your consideration these revealing and pertinent analogies which have implications far beyond artificial boundaries, far beyond state and, indeed, national borders.

-Every minute of every day, five acres of green America become new homes, new shops and factories. Think of it! I am talking in terms of a 24-hour day!

-One percent of our total land area in the United States is already under pavement -- covered by our complex of federal, state, county and city highways.

-Leisure time? The U.S. Department of Labor predicts that, by the year 2000, a 20-hour work week will be commonplace. And, if you will, relate the significance of that figure to pressure on our public lands.

-Most ominous of all, however, are statistics relating to our world population. Here are some pointed projections which, to say the least, have the gravest implications for our natural resources.

1. Thousands of years were required to produce the first billion people on earth.
2. The second billion people took only 75 years to produce.
3. The third billion was reached in 1960 after only 35 years.
4. The fourth billion will appear on this planet in only 7 years.
5. By the year 2000, according to United Nation's census experts, we will have doubled our present population -- and the population of this earth will exceed 6 billion!

I have only touched on a few problems and controversies. Where do the answers lie? I have said that, essentially, our problems are people problems. Through greatly intensified conservation education we can open the doors to information, cooperation, legislation, enforcement, research, decision, funds, qualified personnel and -- most important -- to public awareness and understanding.

Regional Design for Human Impact

Dr. Philip H. Lewis
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Regional Design for Human Impact

Dr. Philip Lewis[1]

An overwhelming portion of the history of mankind is a record of man's efforts to discover and establish his relationships to the natural environment. Up to the present century most of man's time, energy and intelligence has been dedicated to the sustenance and protection of human life, either in a struggle with the forces of nature itself, or with other men over the allocation of the environmental resources.

Today these same basic struggles certainly continue, but we have in this country reached a stage of scientific and social development in which decision need no longer be based only upon the immediate needs for survival. We have sufficient knowledge, abundance and leisure so that a variety of choices is both possible and necessary for the intelligent allocation and utilization of the resources found in the natural environment.

An acre of land is no longer simply another acre to be drained, stripped of trees and foliage, fertilized, plowed and planted for food crops. Now the same acre of land might be more effectively utilized as a wildlife habitat, a nature preserve, or simply as a green belt or corridor to provide relief from the visual monotony of the urban landscape. There is now a possibility of choice--thanks to our affluence and leisure.

It used to be a simple matter to determine the uses of environmental resources. Fish and game provided food, forests provided lumber for shelter, fertile soil, when planted, yielded crops, and rivers and streams were for transportation and the disposal of human and industrial wastes. Now that we are aware of a wider choice of uses, the time has come for a second look at our basic landscape resources.

Certain resource patterns, if developed by man, still offer potential threats to his life and well being, while others, protected and enhanced, can continue to provide many valuable experiences for living, working, and playing.

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In an age of explosive population patterns, a 'second look' must consider at least the following patterns as 'form determinants' for human development if we are to protect and create a balanced natural and human habitat for tomorrow.

The following are form determinants for human development:

Above Surface Patterns

Weather By understanding the various patterns of weather we may shortly and with extreme accuracy predict future paths of storms, forewarning farmers and urbanites of potential crop and property losses. Today we still build some of our highways within snow belts when a new alignment but a few miles further south would save them from the hazards of slippery driving, loss of life and limb, and the cost of extensive snow removal.

Toxic Patterns By a combination of predictable wind patterns and land form patterns we today can suggest where temperature inversion layers are most probable. When concentration of internal combustion machines pour carbon monoxide, carbon dioxide and other poisonous gases into inversion layers, they can become a most serious health problem to human habitation within.

Surface Patterns

Fire Hazards It is relatively simple to identify textural landscape patterns that in a dry season become highly inflammable and threaten all forms of life within their boundaries. Forest fires and grass fires destroy hundreds of homes each year because man through ignorance or gamble still chooses to build within these scenic but dangerous patterns.

Flood High water marks graphically portray the fringe areas of past water patterns created by early thaws and spring rains, or the ravaging waters of hurricanes and tidal waves. To build within such patterns invites certain loss of property and possible loss of life.

Disease Vectors Certain landscape patterns serve as habitat for disease carrying insects that transmit sickness to man. An increasing effort to study and understand these habitats will furnish additional guidelines for human habitation patterns.

Cropland The soil scientist has identified patterns of soils that, in their present state or with the addition of fertilizers, offer the best opportunity for food and fiber production. As populations explode around the world, many areas may well face famine and starvation within the next five to ten years. As responsible citizens, we should protect these most productive soils from human encroachment and see that they are maintained for even higher production through new agricultural technology.

Natural Areas In the analysis of various landscapes it is apparent that we have small remaining areas of landscape as yet relatively untouched by the ax and the plow. Science needs these natural areas as check points; medicine and agriculture may still find in these natural patterns new drugs and new crops; and mankind can always profit in the relief these many natural textures afford from the brick, steel, glass, and asphalt of our cities. These areawide patterns might vary from one tenth of an acre to many thousands in various parts of the country.

Landscape Personality Aside from what remains of these relatively untouched patterns, we can further identify the varied forms and combinations of man-modified natural resources in different parts of the landscape that give each area its distinguishing characteristic. The visual sum or result of these combined patterns of water, topography, wetlands, or forests results in a unique series of regional personalities. The various three dimensional visual patterns of agricultural production, urbanization (townscape), and transportation, also have their own unique personality patterns and add to the perceptual patchwork that is our environment.

Contemporary construction reflecting local qualities of texture, color, and pattern and not a uniform, so-called modern style should be encouraged. The landscape heritage is worthy of expression through varied architecture in harmony with this heritage.

Ethnic Patterns Several other kinds of patterns are important to environmental planning and development. Studies have indicated the variety of ethnic patterns; an extensive variety of local architecture, cooking, handicrafts, museums, customs, and holidays exists within these cultural patterns. This variety is important to environmental quality and needs continued recognition if it is not to be submerged in the current tendency toward conformity.

The ethnic heritage serves not only as a valuable environmental quality and as a tie with the past, but serves also as an important recreational and tourist attraction. It is a heritage not to be exploited, but to be protected and valued. It can continue to help make life interesting and pleasant to both residents and visitors.

Environmental Corridors An opportunity for a comprehensive second look at Wisconsin environmental patterns for 'recreation' was made possible by former Governor Gaylord Nelson's fifty million dollar Outdoor Recreation Act Program. It is apparent from this study that the elements and glacial action through the ages have etched linear patterns (weblike on a regional basis) on the face of the midlands. The flat, rolling farmlands and the expansive forests to the north have their fair share of design beauty, but it is the stream valleys, the bluffs, ridges, roaring and quiet waters, mellow wetlands and sandy soils adjacent to water that combine in elongated design patterns, tying the land together in regional and statewide corridors of outstanding landscape diversity.

In our statewide studies we called these patterns "Environmental Corridors." These patterns offer outstanding opportunities as units for recreational-open space and environmental planning. Once inventoried and mapped, they encourage planning for total environmental design.

These patterns of water, wetland, slopes of twelve percent or over, rims, enclosing slope, and sandy soils adjacent to water, when combined into an environmental system, offer a source of strength, spiritual and physical health, and wisdom for the individual in addition to open space for play, recreation and enjoyment.

By mapping these corridors over the past four years and identifying their precise values, we hope to make the people of Wisconsin clearly aware first of all that such patterns do exist, that they generally encompass the floodplains and topography too steep to plow and are the very lands with a low tax base, and that the critical task is one of seeing that they are protected.

Expenditure of great sums of money on recreational development rather than protective programs simply will not get the most important job accomplished. We can always develop lands once they are protected, but these quality lands will not be available within a few years unless they are protected today!

Individual Resources and Resource Nodes In any statewide program to inventory the many patterns needing protection and wise development, attention must be paid to the landscape features appreciated by farmer Bill Brown, who generally owns the fringe area now passing from country to city.

To tell Bill Brown that we want to protect his aquifer recharge areas, his atmosphere, his hydrosphere, his physiographic divisions, micro-climate, environmental corridors or even floodplains takes a heap of explaining.

However, to inventory his trout stream, balanced rock, natural bridge, waterfall, rapids, lighthouse, Indian mound, cave, and log cabin interests him; we have found that he is often willing and capable of assisting in the inventory of these isolated resources occupying a limited space on his "back forty."

In Wisconsin we now have inventoried and mapped more than 220 isolated specific resources with the help of the farm agents, soil conservation agents and the field people of the conservation department. In turn, these regional representatives worked closely with the local inhabitants--the voting public whose support is critical--in these field studies.

Perhaps the most rewarding result of this statewide resource value inventory was not so much the success of working with the local people (the mere fact of involving them develops a greater appreciation of landscape values), but the fact that by plotting water, wetland and slope on a county-by-county basis we have discovered that more than ninety percent of all the individual resources held in high esteem by the local population also lie within the corridor patterns, often in concentrated areas we call resource nodes. Areas outside these corridors, being less favored by accidents of nature, or reflecting heavier impact by man, are more conducive to human alterations for economic and commercial exploitation, transportation, urban development, farming, and similar activities by man. Nodes possessing many different resources have, in turn, reflected the choice park areas within the corridor having multi-purpose possibilities.

These areas of high diversity, if protected, offer the greatest flexibility in assuring needed resources for both desires and needs of the future. Protected and developed wisely, these nodes, like beads on the corridor necklace, offer a recreational system with a variety of environmental experiences.

Potential Reservoirs Water supplies have become extremely limited in many parts of the world, and will depend on new reservoir systems. In planning new reservoirs we consider land forms that create natural bowls and can easily be developed. These patterns must be identified and protected from urban encroachment if they are to serve as new sources of water.

Utility and Transportation Corridors Environmental and functional factors can suggest the most logical patterns for future utility lines, street extensions, and highway alignment. These corridors must be identified and protected from other urban uses if we are to develop these systems in a comprehensive way for the future.

Human Waste and Disposal Few people today, if asked, could identify where in a university or industrial community all past wastes from chemistry and research labs have been disposed. Some, no doubt, have been unwisely located above geological formations, making it possible for seepage to pollute underground water supplies. Offensive odors from such areas can also make human occupation impossible.

Sub-Surface Patterns

Aquifer Recharge Within many of our landscapes we find our aquifer recharge patterns. These are basically porous patterns that permit our surface waters to penetrate the surface of the landscape and refill our natural underground storage systems. Protected from high density development, and assuming that we will have a normal rainfall, our underground storage systems will continue to provide drinking water for present and future generations.

Ground Water Geologic processes have created beneath the land's surface underground water storage systems. Since they contain much of our future water supply it is vitally important to know where these patterns are.

Building Material In many landscapes the geologist has identified patterns of sand, gravel, limestone, and other minerals all necessary for the construction and reconstruction of our expanding cities and transportation networks. Human encroachment should be prevented above these valuable deposits if we are to have an economic supply near expected development. Underground excavation of minerals may also leave surface patterns unstable and subject to cave-ins and loss of property.

Volcanic-Earthquake Patterns Each year we read of loss of life and property because man located his human use patterns in the paths of potential lava flows or straddles unstable fault lines. Homes, highways, campgrounds, and whole cities have been known to suffer severely because of such improper location.

Human Impact

If we are to develop alternative guidelines for directing human impact in harmony with these recognized patterns, it is becoming more obvious that we must also know more about the range of human impact.

At a recent conference in London entitled "Countryside 1970," it was discovered that although the English have not inventoried their natural and cultural values as one would expect, they have classified their human impacts on the countryside. In Paper #2 of an earlier "Countryside 1970" meeting, Dr. E. M. Nicholson and A. W. Colling suggested that while many discussions and analyses have been made of various parts of the problem of human impacts on the countryside, it appeared that no really comprehensive list and description was available. They then proceeded to create a chart identifying all activities and operations having an impact on the English landscape, area or land-type affected, nature of affects arising, incidence-time, space, degree, parties interested, and examples of problems and possible solutions.

In conclusion they pointed out that the chart was a tool for overall survey, for tracing relationships and for putting particular impacts or other factors in perspective. One of the broad points which seem to emerge from the chart was the very heterogeneous nature of the activities and operations responsible for impacts on the countryside, and the apparent lack of awareness among those concerned of their role in this respect.

Human Needs To seek an 'optimum' environment through 'awareness' programs, then, requires not only a better understanding of the diverse landscape patterns and the nature of human impacts, but also requires a much better understanding of the environmental needs of man. Our new Environmental Design Center at the University of Wisconsin stresses that research findings have identified relationships between the physical environment and human performance; that physiological health and psychological well being are affected by environmental variables; and that social behavior is influenced by enabling elements of the physical environment. Much still remains to be done in giving design interpretation to these many physiological and psychological factors.

Inventory Tools Recognizing that the time, talent, and funds needed to obtain such comprehensive environmental data by traditional means is inconsistent with practical situations demanding integrated development at various scales and that there is the added problem of keeping current such project inventories, it is time we seriously consider solutions to these critical problems.

Aerial photography has been investigated sufficiently to indicate that, although far from ideal, it clearly offers one of the best hopes for efficient data collection. It promises results in a realistic time span at a cost that is in proper proportion to each inventory phase. An even more promising inventory tool might be the non-conventional air borne sensor. A sensor system placed in a stationary satellite might provide not only current data but, linked to a regional computer graphic system, offer new and changing patterns as they evolve.

Awareness Centers Identifying in any manner the most outstanding natural and human values does not, of course, assure their protection and wise development. Techniques must be developed for presenting these environmental studies to the general public in conceptual and pictorial form.

Until clear pictures and concepts about man and his environment, the problems, potentials and causal relationships are disseminated and become part of the common stock of knowledge, there can be little progress in guiding human impact in harmony with identified natural and cultural value patterns.

Recent advances in audio-visual presentation have developed a more direct relationship between the subject and educational materials. Nothing short of exploring these new dioramas, three dimensional movies, computer programmed slides, and "think boxes" will do if we are to develop environmental 'awareness.'

By integrating a broad scientific and perceptual awareness of the meaningful environmental patterns with human impact, human needs, new inventory tools, and imaginative Regional Awareness Centers much can be done to create a new design form for our local and regional environments. The design form which would evolve from this deeper understanding will not likely be arbitrary or preconceived. Rather it will be a functional expression consistent with the inherent needs of man and his environment.

Examples of Environmental Improvement

Chairman Dr. William J. Kimball
Extension Leader, Resource Development
Michigan State University

The Gaylord Story
Mr. Harold A. Elgas
President, Gaylord State Bank
Gaylord, Michigan

Regional Planning in Southeastern Wisconsin
Professor William D. Rogan
Agri-business Agent, University Extension
Waukesha, Wisconsin

The Green Bay Story
Mr. John Cook
Chamber of Commerce
Green Bay, Wisconsin

The Gaylord Story

Harold A. Elgas[1]

At best a very ordinary small town, population 2,800 in the heart of the Northwoods country, eight years ago Gaylord, Michigan took an honest look at itself and didn't especially like what it saw.

The drab, unattractive appearance of Main Street, punctuated with more than fifteen vacant, down-in-the-mouth store fronts, was not an inviting sight for local residents, for the area shoppers, nor for the thousands of tourists who streamed into the area each year. Off-street parking was at a premium and almost non-existent. The same self-analysis showed that commercial property had depreciated in value, and that young people, finding few job opportunities, were leaving the area to find work.

Confronted with the problem of a decaying Main Street and uncoordinated negligible results in efforts to attract new industry, the community could come to but one conclusion: something had to be done, and done fast.

The first step in a concerted effort to broaden the community's economic base was taken in 1958 when over 100 businessmen formed the Gaylord Industrial Development Corporation. With assets of over $100,000 the non-profit organization purchased several tracts of land and assembled voluminous information of interest to industrial leaders. Five years of intensive aggressive effort by the Industrial Development Corporation produced the first major breakthrough. It came when the United States Plywood Corporation announced plans to build a 5½ million dollar Novoply Plant within a mile of downtown Gaylord. This announcement came in August, 1963. The plant is now in production and the modern facility has a payroll of 1.4 million and raw material expenditures amounting to over 1.2 million dollars annually.

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[1] President, Gaylord State Bank, Gaylord, Michigan.

Simultaneously, Interstate Highway I-75, a four lane limited access freeway running from Canada to Florida, was opened running through the western limits of the City of Gaylord. This highway is bringing hundreds of thousands more people more frequently to the area each year. This stimulus created a business boom; hundreds of new homes were built and optimism ran feverishly throughout the business community.

In 1962, Gordon Everett, publisher of a shopper's guide and a new businessman in Gaylord, saw in Birmingham, Michigan, a Colonial motif that impressed him as being especially attractive. He learned that the late Don McLouth, Detroit industrialist, who established the beautiful Otsego Ski club, built in a Swiss Chalet style on the edge of the City of Gaylord, had at one time endeavored to have Gaylord re-do its business community in a Swiss design. Realizing that this idea had to be sold, Everett photographed the block in which his own building was located and invited a Bellaire architect to show graphically from an artist's rendition what could be done to a given block of stores in contrast to the photos.

Harry E. Collins, Secretary-Manager of the Chamber of Commerce, an untiring work horse in the community, presented the architect's proposal to his group. The reaction was enthusiastic--to put it mildly. An aggressive community development committee swung into action, and before long, Project Tyrol (later named Alpine), modern merchandising with old world charm, was launched. A committee headed by Dr. Louis F. Hayes held a mass meeting of all merchants to inform them of the plan. This meeting was paneled by experts in every field--construction, architecture, insurance, taxation, finance, merchandising, and community planning. A previously compiled report presented at this meeting revealed only 6 of 57 businessmen surveyed indicated no interest in proceeding with this plan. As a pace-setting project prior to Project Tyrol, was the construction of a beautiful new Gaylord State Bank building, which brought about the elimination of a blighted area in the central business district consisting of eight unsightly buildings (five of which were vacant). The Alpine theme employed was carried out by the use of native stone, exposed beam ceilings, and attractive landscaping. Following this in the spring of 1964, Guggisberg Clothing Store, Denholm's Little Dime Store, and the Audrain Hardware, began the exterior remodeling of their buildings to conform to Alpine motif. Of particular note, is the Guggisberg name, which came from the town of Guggisberg, Switzerland.

Some of the greatest victories in this program to date are stressed by the fact that three national chains with standard prototype designs have departed and voluntarily remodeled in the community using an Alpine theme. In addition, of the six businessmen who originally expressed disinterest in this project, three have remodeled their stores and two others have been succeeded by other enterprises.

Other industry, including national warehouses, has been attracted to the Gaylord community. With the tremendous traffic impact on I-75, every major brand of gasoline is represented in or near the city. There have been constructed restaurants, motels, stores, churches, a new auto sales agency, Alpine teen center and hospital care facility. This comes from an improved industrial climate, an interstate highway, and an Alpine image. Forty-four establishments have been built new, remodeled, or have adapted to Alpine architecture in the past three year period. Combined, this represents an investment of 2½ million dollars by private financing and individual enterprise. The 15 vacant store buildings have disappeared from the street. Property values for many businesses have doubled. Employment runs at an all-time high, with the percentage population growth in the County exceeding any other of the 33 counties in Northern Michigan.

In 1964, the Chamber of Commerce appointed a parking committee to study off-street parking requirements. This group made studies, drew plans, took options, and thoroughly informed the entire merchant group who volunteered a special assessment district, sharing with the city through its building authority the cost for 222 off-street parking spaces, behind the stores in the central business district.

In 1965, a successful week-long Alpine Festival was organized, drawing tens of thousands, with more than a thousand residents dressing in Alpine costumes for the occasion. Pontresina, Switzerland, has been designated a sister City through work by Warren C. Smith, new Plywood Company Industrialist. The fourth annual festival will be held July 17-21, 1968.

Gaylord draws its success from the initiative of its people, the contribution and sacrifice by its individuals and enterprises, by the attraction of industry, by the cooperative efforts of the entire central business district to project an Alpine image, and by a strong city and county government which has been willing to shoulder its share of problems.

Joining in the community campaign and contributing to its success were Consumers' Power Company, Michigan Bell and General Telephone Companies, Michigan Consolidated Gas Company, New York Central Railroad, and Michigan's Senator Thomas F. Schweigert of Petoskey, a professional forester.

Agencies and institutions which assisted in Gaylord's rejuvenation included the Forestry Geological Survey and Land Development and other officials of the Michigan Conservation Department; the U.S. Soil Conservation Service; Michigan's Water Resources Commission; Department of Commerce and its office of Economic Expansion, Public Services Commission, Department of Aeronautics, Highway Department; Michigan's College of Mining and Technology; and Michigan State University and its Cooperative Extension Service.

In addition to numerous loans with local banking sources and city correspondence, cooperation with the Small Business Administration resulted in eight loans for financing Gaylord business expansion.

Gaylord has become the Alpine Village. Its people have met the challenge of the future through initiative, leadership, vision, and determination.

Regional Planning in Southeastern Wisconsin

W. D. Rogan[1]

My purpose is to present to you a report on the Southeastern Wisconsin Regional Planning Commission as an outstanding example of Environmental Improvement. I also submit that it can be a strong answer to some of the conditions of concern that caused this conference to be created.

Regional Planning has become important in the State of Wisconsin. Some areas have been fearful of regional planning because they have felt that it might undermine or reduce the strength of local governmental units. The truth is quite the opposite. Through voluntary regional planning the efforts of local governmental units can be better coordinated and made more effective. The need for good planning has always been important, but never more urgently needed than right now.

The Southeastern Wisconsin Regional Planning Commission was established in 1960 under the provisions of the Wisconsin Statutes and upon the unanimous petition of the seven county boards concerned. It is one of a number of planning commissions to be created in Wisconsin to date under the state regional planning enabling act.

The Region is comprised of the seven southeastern Wisconsin counties of: Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington and Waukesha. These seven counties have a combined area of 2,689 square miles or about 5 percent of the total area of the state; a total population (1966) of 1,758,000 or about 42 percent of the total population of the state, and contain 44 percent of all the tangible wealth of the state. These seven counties comprise one of the fastest growing urban regions in the United States and in the last decade accounted for more than 64 percent of the total population increase of the state. There are 11 major watersheds and 153 general purpose local units of government within the Region.

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[1] Professor, Agri-Business Agent, Waukesha County, University Extension, The University of Wisconsin.

The Commission consists of 21 citizen members, three from each member county. One Commissioner from each county is appointed by the County Board of Supervisors; and two from each county are appointed by the Governor, one from a list certified by the County Board. The full Commission meets regularly on a quarterly basis and is governed in its operation by the state regional planning enabling act and by its own duly adopted bylaws.

Regional planning as conceived by the Commission has three principal functions:

1. Areawide research, that is, the collection, analysis, and dissemination of basic planning and engineering data on a uniform, areawide basis so that, in light of such data, the various levels and agencies of government and private investors within the Region can better make decisions concerning community development.

2. Preparation of a framework of long-range plans for the physical development of the Region, these plans being limited to those functional elements having areawide significance. To this end the Commission is charged by law with the function and duty of "making and adopting a master plan for the physical development of the Region." The permissible scope and content of this plan as outlined in the enabling legislation extend to all phases of the regional development, specifically emphasizing, however, the preparation of alternative spatial designs for the use of land and for the supporting transportation and utility facilities.

3. Promotion of planning and plan implementation through the provision of a center for the coordination of the many planning and plan implementation activities carried on by the various levels and agencies of government operating within the Region.

The Commission has been involved in 12 major planning programs to date. I would briefly like to explain 2 or 3 of these programs.

The Commission chose the transportation problem as the objective of its first major planning effort and in January of 1963 undertook a 3½ year regional land-use-transportation study which has now been completed. The primary objective of this study was to produce two of the key elements of an advisory plan for the physical development of the Region; a land use plan and a transportation plan. These two important plan elements provide the necessary basic framework for more meaningful state and local planning efforts within the Region, for the preparation of additional regional plan elements, such as comprehensive watershed and urban planning district plans, for the preparation of additional areawide public facilities and utilities plans.

This objective was achieved; and the plans were adopted by the Commission and transmitted to the constituent local units of government for consideration, adoption and implementation. The regional transportation plans have been adopted by all seven of the County Boards within the Region and the land use plans by six of the seven County Boards. In addition, the plans have been adopted by such important state agencies as the State Highway Commission and the State Conservation Commission and by certain federal agencies as well.

The individual municipalities comprising the counties have also been asked to adopt the recommended land use and transportation plans as an advisory guide to the physical development of their communities, and we hope that all will see fit to do so since we believe these plans to be in the best interests of the local municipalities, as well as of the counties and of the Region as a whole.

The land use plan seeks to meet the physical, economic, and social needs of the Region by allocating sufficient land to each of the various land use categories to satisfy the known and anticipated demand for each use, incorporating to the extent possible proposals contained in existing community development plans and zoning ordinances. The plan seeks to protect and enhance the natural resource base of the Region and allocates new urban development only to those areas of the Region which are covered by soils well suited to such development. More particularly, the plan seeks to avoid urban development requiring on-site septic tank sewage disposal systems in those areas of the Region covered by soils unsuited to the utilization of such systems, thereby abating water pollution problems and avoiding the intensification of existing and the creation of new environmental problems. The plan seeks to protect the shoreland frontages of the potential lakes and streams of the Region from incompatible development; to protect the floodways and floodplains of the perennial streams and watercourses from urban encroachment; and to protect the best remaining woodlands, wetlands, fish and game habitat areas, and potential park sites from destruction through improper urban and rural development. The plan seeks to protect all of the primary environmental corridors within the Region from incompatible development, utilizing these corridors for the basis of an integrated system of park and open-space reservations. The plan also seeks to preserve the best remaining agricultural areas within the Region for agricultural and open-space use.

The land use plan recognizes the interdependence between the land use pattern and the transportation and public utility systems which serve and sustain it. It seeks to encourage urban development in those areas of the Region which can be readily provided with gravity drainage, sanitary sewer service and public water supply. Most importantly, the plan seeks to mutually adjust the land use pattern and the demand this pattern creates for, and the loadings upon, transportation and utility facilities to the spatial location and capacities of these facilities.

The adopted transportation plan seeks to provide the Region with a well-integrated, balanced, safe, and economical transportation system.

The recommended land use and transportation plans are proposals of the Commission. These proposals cannot be put into effect by the Commission, but only by the local units of government concerned and by certain agencies of the state and federal government. Prior to their adoption by the Commission, the recommended plans were carefully reviewed and approved by a technical coordinating and advisory committee, which included county officials as well as representatives of state and federal governmental agencies and also private utility corporations. The plans were also reviewed and approved by an intergovernmental coordinating committee, with representation from each county.

Another major effort is the watershed planning program. There are eleven major watersheds that are contained wholly or partly within the Southeastern Region. It is hoped that comprehensive plans will be developed for each one. At present one is completed, the Root River study; another, of which I am the chairman, the Fox River study is scheduled for completion by December of this year. Two others have been started.... Milwaukee and Menomonee River studies.

In the Fox River the major problem areas being studied are those relating to flooding, water pollution, park and open-space reservation, deteriorating fish and wildlife habitat and changing land use.

Each of these watershed studies has been guided by committees composed of representatives of federal agencies such as the Soil Conservation Service, U. S. Geological Service, U.S. Corps of Engineers, state agencies such as Conservation Division, State Board of Health, University of Wisconsin, county agencies such as Park & Planning Commission, Sewerage Commission, and County Board Supervisors. In addition city officials such as mayors and directors of public works were also members. Membership also involved industry and the public as evidenced by the membership of bankers, industrialists, farmers, consulting engineers and interested citizens, an excellent cross section of community life.

One of the most valuable work programs undertaken by the Commission was the detailed operational soil survey.

Soils are used for many purposes and have a direct bearing on how we live. These purposes include streets, highways, other transportation facilities, recreational purposes, supporting buildings and the natural beauty of the landscape. Some of our domestic and industrial wastes are absorbed in the soils, and we construct reservoirs, ponds, and dams with soils. Not all soils are equally well suited to these expanding land uses.

The detailed soil survey of the Southeastern Wisconsin Planning Region shows that we have inherited our share of problems.

It is not new to most of us that these soil conditions are causing severe problems as urbanization spreads throughout the region. Sewage is often seen in road ditches, on lawns, or trickling into lakes and streams. Building a durable road across such soils is often very expensive. We can overcome some of these soil problems with special construction or land use practices. Others are so difficult and expensive to remedy that it is usually cheaper and easier to move to another site. We certainly can intensify problems by going ahead blindly.

To overcome soil limitations we must know of the problems in advance. That is where the detailed soil maps are useful. They show the locations of more than 300 different kinds of soils mapped in the region. Anyone wanting to know what soils occur on a given tract of land can identify the soils from these maps. Limitations of the soils for different land uses are available in interpretive tables or from discussions with conservationists and scientists familiar with the maps and the soils. These men can sometimes look at local sites which have special soil problems.

The completed soil survey constitutes a basic scientific inventory which is not only essential to the intelligent preparation of regional development plans but is also of great value in making day-to-day development decisions within the Region. The detailed nature of the soils data obtained in the survey, together with the interpretations provided, permits its application to both public and private development decisions at all levels of community planning and development. The report contains, in addition to information on soil formation, classification, description, and occurrence, detailed data on the chemical and physical properties of the soils; water management characteristics of the soils; suitability of the soils for specific engineering purposes; and suitability of the soils for selected rural and urban land uses, including agricultural use. The soils report can be used to determine the best use for the soils of a given area or, conversely, to select the best soils for specific uses. Land developers, builders, engineers, planners, architects, farmers, conservationists, hydrologists, appraisers, and realtors as well as individual home buyers, have found the information contained in this report a useful tool in making day-to-day development decisions.

One of the conditions for this conference was "the need to identify specific possible action that can be taken by educational institutions and others to reduce this knowledge gap."

As the University of Wisconsin functions as a major knowledge resource in the State of Wisconsin, the function of University Extension is to get these resources out of storage and into use throughout the state. To do this we operate in many areas of service all of which relate, in some significant way, to the job of regional planning.

A large portion of University Extension resources, at the county and state levels are concerned with improving and maintaining the quality of our environment. Staff experts in water resources, land use planning, air pollution, soil and wildlife conservation are dealing with the community problems of maintaining a quality environment throughout the state. The University has played a significant role both in the drafting of the most comprehensive water resources law in the United States and also has exercised an important educational role throughout the state in the implementation of this law.

A second important area in which both county and state Extension staff have played an important role is in bringing university resources to bear on problems of economic development.

The major purpose of University Extension is to bring about changes by providing people with purposefully designed learning experiences. The process of Extension education is one of working with people, not for them -- of helping people become self reliant, not dependent on others. In short, helping people by means of education by putting useful knowledge to work for them.

University of Wisconsin and University Extension has been, and I believe will continue to be, an active participant in the development and implementation of the Southeastern Wisconsin Regional Planning Commission program. The director, Kurt Bauer, has on many occasions charged Extension with the educational responsibility for the Commission's programs to the people in the area.

Let me use the soil survey project as an example. In the early stages of its development Extension agents felt that this could be a very important educational program in planning changes in land use. As a result an educational project was developed to be conducted in the whole Southeastern Wisconsin area to focus greater emphasis on the importance of using soil survey information. The intent of this project was and still is to provide user groups with many different kinds of learning experiences which will help them better understand why the soil is an important factor and why it should be considered in planning for future land uses.

The project objectives are to ensure that maximum possible use is made of detailed soil surveys by all persons in the Region for whom it will prove useful. These users of soil surveys should make maximum use of this resource inventory in: land use planning and zoning, farming, industrial, residential, recreational, transportation development, engineering sewage and water disposal, schools, real estate, finance and other enterprises or activities which involve land and its uses.

The teaching objective was to have all members of each potential soil survey "user group" develop a basic understanding of what a soil survey is, how it is useful to his special needs and what limitations it has for the uses with which he is concerned.

As an additional aid to this project we developed a Waukesha County Soil Demonstration Farm Project.

We've used the information from the detailed soil map to plan alternative uses of land on this farm --- involving agriculture, housing, industrial development and recreation.

Much of our land use is changing. But farming is, and will continue for some time, to be the most extensive user of land in the region. On this demonstration farm the soil map was used as a source of facts to develop a farm conservation plan. We identified sloping soils from the map and selected appropriate erosion control practices. The soil map shows location of wet soils. Interpretive tables show suitable drainage systems for agriculture and key facts for their installations.

Homes for the burgeoning population of the region are major new users of land. The maps identify wet subsoils where basements must be equipped with sump pumps if they are to be something more than an indoor swimming pool. The maps also show where septic tanks and seepage fields are a poor risk because of wet soils, flooding, very slow permeability or shallow bedrock.

Two large plan maps show how residences can best be fitted to this land. One plan map is based on installation of private wells and septic tanks. The other is based on installation of public sewer and water supplies. Because of wet soils on this land, only about half of it can be used for houses with septic tank systems.

Other large plan maps of the farm show how the land could be used as an industrial park and as a recreation area.

The soil map provides key facts for locating sloping soils where extensive cutting and filling will be needed before large buildings can be built. It also shows wet soils where it can be expensive to install stable footings and foundations for large buildings.

The recreation plan is fitted to the land on the basis of both soils and topography.

Zoning is now being used in urbanizing regions to set up land use control. We have drawn up a zoning district map that fits the soil and topography. This map integrates land uses with those already existing around the farm.

The demonstration farm and the materials used are the result of cooperation among several agencies and people. Waukesha County institutions made the land available. The U.S. Soil Conservation Service made and interpreted the detailed soil survey. The Southeastern Wisconsin Regional Planning Commission and the Waukesha County Park and Planning Commission developed many of the land use plans we illustrate.

University Extension-Waukesha County led in the development of the entire project. The University of Wisconsin gave technical and advisory assistance. It is a team project...the only one of its kind in the United States.

In order to achieve the full value of the detailed operational soil survey, an interagency Memorandum of Understanding was developed with the U.S. Department of Agriculture, Soil Conservation Service, University Extension, Southeastern Wisconsin Regional Planning Commission, and the seven county soil and water conservation districts comprising the Region. The agreement provides for the extension of technical information and educational services to local officials, citizen groups, and interested individuals on the need for, advantages of, and uses of the detailed operational soil survey.

Under the agreement Extension will assist, participate, and cooperate in educational programs relating to the dissemination and use of the detailed operational soil survey, including the identification of soil survey user groups requiring special educational programs and efforts, the preparation and conduct of such educational program efforts, and the assembly of resource persons and educational materials.

There are four areas in which education is needed. In fact, education is the key, if these programs are to benefit our region. They are (1) shoreland and floodplain zoning, (2) protection of environmental corridors, (3) preservation of agricultural land for its economic value and also for its aesthetic and environmental value, and (4) pollution abatement.

University Extension has a most important role, perhaps the most important role, in the implementation of the land use and transportation and watershed plans. At present two of the counties have conducted land use conferences and one county has held a water pollution conference. The purpose of these conferences was to acquaint residents with the function of the county and regional planning groups in developing plans for the county and to assist in the development of programs and plans for orderly growth.

The need for good planning has always been important, but never more urgently needed than right now. University Extension accepts the challenge because it is the Wisconsin Idea at work.

The Green Bay Story

John Cook[1]

I am here to discuss some of the history and yes, some of the successes of people--the people of Green Bay, Wisconsin.

Green Bay really is a pioneer in the battle of air pollution. In 1945, it was known as one of the dirtiest cities in the United States. The eye doctors of our city spent about 90 percent of their time removing foreign objects from eyes. As you walked down the streets there was a constant crunch of small cinders and particles underfoot.

In 1945, the League of Women Voters needed a local project. One of the members, Mrs. Ralph Curtis Smith, swept a box of soot, cinders, dust, and fly ash from her front porch, less than seven blocks from the downtown area. She took it to the following meeting of the League.

They decided that this was to be their project, to work for an air pollution control ordinance. They studied and worked five years to show the damage done and what might be done with by-products. They held panel discussions before most of the service organizations, brought in business leaders, and held political forums to try to get men into office who understood the problem and would help.

Mayor Olejniczak appointed a city wide group--"The Mayor's Committee for a Cleaner and More Beautiful Green Bay", a mouthful, but an effective committee that is a strong force in Green Bay. With the assistance of the city attorney, an ordinance was drafted and in 1950, Green Bay's air pollution ordinance was passed. It covered more than just air pollution and it also included a penalty clause.

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[1] Retail-Wholesale Division, Chamber of Commerce, Green Bay, Wisconsin.

This committee is people, these are the "theys" you hear of so much, It consists of the mayor, heads of all city departments and most important, 207 service related organizations along with many interested citizens. The nucleus of course, is the city inspection service, (including an air pollution inspector - originally an engineer) and the police and fire departments. (These representatives are real keys. The fire inspectors call to the attention of the police department and the committee, any violations of litter, junk, water and air pollution. The committee has the support of the police and as the patrolmen cruise the city, they report and even photograph violations which are later called to the attention of violators.)

The real power of this committee is people or involvement if you will. Mrs. Ralph Smith has served as secretary and twice represented the committee in Washington to receive awards. She has labored hard and long on this project and if every city had such a leader, I could assure you the pollution and litter problem could and would be licked.

The task of the committee in reality is one of education, and from the beginning this committee has worked closely with younger groups, the schools, YMCA, YWCA, Boy Scouts, Cub Scouts, Girl Scouts, with a dual purpose in mind.

First, these groups of youngsters have that tremendous unbounded energy that only needs real direction by leaders to attain some spectacular results.

Second, there is a more subtle outcome. As youngsters work on this program they become aware of a problem and as they grow up they become the real potent boosters for a cleaner and more beautiful Green Bay (or any other community).

I would like to give you a couple of recent examples:

- YM Girls -- Under Mrs. Griffin, received a city achievement award in Washington, D. C. last month - National Clean Up, Fix Up.

- Cub Scout Pack #7 from the Cathedral School received the Youth City Achievement Award from the Governor in Madison for cleaning up the East River Banks. This was the only scout project in the state brought in for an award.

Don't you think for one moment that these youngsters will ever forget this experience. They will be better citizens for it.

This committee has been fortunate in leadership, in cooperation, and in results; and as you probably are aware we like a winner here. In 1965, Green Bay became the first Wisconsin winner of the Look Magazine sponsored "All American City" award. The award was presented to the city in May of 1965.

In October 1965, Green Bay won the "Keep America Beautiful" city award in New York City. I am sure you are aware that these awards are given for citizen action.

In February, 1965 and 1966, Green Bay won Honorable Mention awards in the National "Clean Up, Paint Up, Fix Up" contest in Washington.

I wish to list a few of the things done by the committee:

1. In downtown areas, there has been a rescheduling of trash pick-up by city trucks and a concerted campaign to put trash out at a set time. This is a continuing effort, but there is much less trash to blow through day and night. Also, a beautification program, - two of the islands are now in on Washington Street, financed by downtown businessmen and property owners, hopefully more will be installed.

2. In schools there has been distribution of 8 X 10 litterbug cartoons and a continuing education program by teachers and supervisors in public, parochial and vocational schools (both in school and adjacent areas).

3. A pledge is administered to all participants in the Park and Recreation Department activities. The pledge:

   > "As a Young American, I promise not to break or spoil anything with which I work or play. I will not throw paper, candy wrappers, fruit peelings, or other trash on sidewalks or roads, in parks, playgrounds, lots and yards -- whether I am walking or riding in a car. I will help keep my playground clean and will be as careful of other people's places and things as I would like them to be of mine."

   Each playground has its own policing squad, skits are made up, there are poster contests, coloring cards -- all stressing the elimination of litter. A prize is presented by the Mayor at our Annual Kiddie Karnival.

4. The river banks have been cleaned up considerably through the cooperation of the Outboard Motor Club and the police. River hulks had to be traced and cleaned up. Scouts helped in the clean up and the city assisted in building retaining walls and maintaining them.

Packer stadium had a litter problem. The cost to the city after a game was approximately $1350. This gradually has been cut down to $620 per game and will go lower. This was done with public education, signs and plenty of litter cans.

Our biggest problem has been dust. In 1950, dust collected in downtown Green Bay showed 90 tons per month per square mile. This has dropped to about 16.7 tons per month per square mile. While the greater use of gas as a heating fuel has helped tremendously, the work of our air pollution inspector has been outstanding. In our ordinance we have an enforceable air pollution section, something less than 30 percent of the cities in the United States have. I have with me an analysis of dust collected in the month of February if any of you might wish to see it after the session.

I would like to point out that this committee has operated on a minimal budget. The average expenditure per year was less than $30, excluding travel which was donated by the members.

Industry has been most helpful, they are willing to assist in any feasible way. When problem areas arise and these are called to their attention, they will go the extra mile and assist. They too are crying for technical assistance to help lick the problems in this area. You as educators can be a great help. Give us ways that industries can economically salvage by-products they develop from wastes and industry will do the job.

Offer yourselves as educators to groups such as our Mayor's Committee as technical advisors and give us of your skills as well as the use of techniques and labs to help us get the job done.

Don't forget for one minute that you too have a continuing education job on the students, whether it be high school, college, or what. We as well as you have a responsibility in the continuing education of every student so that they are more aware of their environment and the continual task of improving it. This is a real job.

Give us new standards in environmental improvements, update them and keep all of us working, people will do the job even though it is tough on all of us.

A few random notes:

1. How about a universal litter can, a design that will catch everyone's eye?

2. Can you develop a new type Ringleman chart, not for smoke, but for water pollution that everyone can read and use?

3. Can you develop products that are useful from what is now polluting our water, our air, our land?

4. Can you develop new and better ways to control soil erosion? Can you help us to help ourselves and future generations?

This is part of the role of education and educators. Take the leadership position, become completely involved. It has become and will become even more a political issue, but see that knowledge is used in political arguments, not the old wives tales we've been fed too often in the past. You have heard a small story of a group that lucked out, and I use the term not at all disparagingly, in over 20 years of real work. If this group had had the assistance and technical know-how of our soon to be University of Wisconsin-Green Bay, could it have been accomplished in 10 years? I think it might. Suppose we had had a University of Wisconsin-Green Bay 20 years ago as a focus, a gathering point for the work of this committee, and then surmise how much further along we could have been. Gaining one year is tremendous; could we have gained the 10? Will you educators help?

Think also, you who haven't started this project, can you wait 20 years? It will take all the know-how in this room and many others like it to gain back what we have lost. That is the challenge I throw out to you. Take the responsibility of real leadership.

Where Do We Go From Here?

Chairman Dr. Uel Blank
Professor and Recreation Specialist
The University of Minnesota

Quest for a Quality Environment
Mr. Robert Penn, International
Representative, United Auto Workers
Detroit, Michigan

Summary of State Discussions

Closing Remarks
Dr. Ray Vlasin, Assistant Chancellor for
Extension, University Extension and the
University of Wisconsin - Green Bay

Quest for a Quality Environment

Robert Penn[1]

Let me first apologize for Mr. Pat Greathouse, the Vice President of our union. Urgent business prevented his being with us, however he did direct me to extend to you his best wishes.

Permit me to present a quick overview of the various facets of this conference and discuss what I see as the interrelationships of these facets.

The role of the

Scientist - establishes hypotheses and determines facts; quest for answers;

Educator - interprets the findings of the scientists and experts to inform and educate the public;

Public or Citizen - integrates this knowledge and acts.

If this interrelationship does not function smoothly it can lead only to confusion with resultant inaction or inappropriate action. The educator is the middleman. Information is only important when John Public can understand it.

The public or citizen is represented in various ways--as an individual citizen, as a member of various organizations such as the League of Women Voters, the Conservation Foundation or the United Auto Workers to name several and as a member of the community at large.

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[1] International Representative, United Auto Workers, Detroit, Michigan.

Implementation is the major problem. What are the basic steps to implementation?

Awareness of what's happening to environmental quality in the United States

Motivation to do something about it

Action toward the solution

All of these ingredients must be aimed toward the citizen.

To conclude, I would hope that this conference does not end this afternoon but rather that this meeting marks the first phase of an intensified effort to work toward solving the problems of our environment. I would recommend that action committees be organized in each of the three participating states with membership comprised of all interests represented here as the initial step toward working together to identify solutions, educate the public and implement action which will lead to the achievement of our goals. The scientist, educator, citizen, voluntary organization, industry and labor must work cooperatively.

On behalf of the United Auto Workers let me thank you for the opportunity to participate in this important and timely conference. The United Auto Workers has had a long history of battling for just and vital causes. Let me say here that we have enlisted for the duration in this quest for a quality environment.

Summary of State Discussions

Michigan

Merrill Petoskey[1]

The Michigan delegation decided that the first purpose of the meeting, an increased understanding, was largely achieved. However, evaluation of the knowledge gap between science and the citizen and identification of specific efforts that can be taken were not accomplished. The group decided that

1. There is need to increase understanding of environmental problems on various levels and that specific efforts toward solving those problems must be taken.
2. The Michigan representatives must have a meeting in Michigan to further evaluate this conference and more extensively assess what kind of state program should be undertaken as a result of that evaluation.
3. It was tentatively determined that representatives of education, state and local government, labor and industry should have a role in planning effective action toward fulfilling the purposes of the conference.

The Michigan delegation expressed the opinion that additional discussions leading only to further exchanges of information on the problem would be an inadequate effort toward achieving the purposes of the conference.

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[1] President, MACE, Conservation Department, Lansing, Michigan.

Minnesota

Benjamin Patterson[1]

Items 1 and 2 were identified by the Minnesota delegation as top priority for initiating appropriate action toward fulfilling the conference objectives.

1. Another meeting of the Minnesota delegation is essential to determine the next steps to be taken in attacking the problem of deteriorating environmental quality.

2. Public awareness must be directed to the problems of pollution, conservation, and environmental quality. Channels to work through include

    a. formal education
    b. adult education
    c. special teacher training
    d. education of any offenders

The following recommended actions were also designated as important to the effort to improve environmental quality. (Items are not ranked on a priority basis.)

3. Encourage better coordination among federal and state agencies to

    a. improve the overall understanding of the multitude of laws concerning water and its use.
    b. prevent overlapping and duplication of functions.

4. Interpret the Environmental Quality conference to all Minnesota citizens.

5. Define the objectives of environmental control.

6. Develop adequate tools and procedures for involving interested organizations.

7. Establish what groups were not represented at the Green Bay Conference and involve them.

8. Complete a total analysis of Minnesota's environment.

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[1] Northern Great Lakes Resource Development Committee, Deer River, Minnesota.

9. Inform the legislature of the total scope of the problems of environmental control.

10. Establish specific task forces for identified projects.

11. Each higher education institution should assign one liaison man to direct that school's talent toward the identified problems.

12. Decide when to take problems to the public and when to go to the decision-makers, and what type of presentation to make to each.

13. Work closely with groups such as the United Auto Workers who say "if the industry can't be cleaned up then get rid of it as presently constituted."

14. Study the problem of lack of police powers within present concept of state law enforcement.

15. Proclaim a "Conservation Day."

Wisconsin

Mrs. Ruth Clusen[1]

Discussion of the Wisconsin delegation resulted in the following suggestions for desired action.

1. Use the present state Council on Natural Beauty as a vehicle for communication among interested organizations.

2. Provide a forum to discuss legislative measures dealing with environment which are before the legislature and the Congress.

3. Hold an annual state conference drawing on interdisciplinary resources concerned with the problems of a quality environment.

4. Create laboratories or demonstration projects similar to the agricultural experiment stations to coordinate team efforts in demonstrating University information.

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[1] League of Women Voters, Green Bay, Wisconsin.

5. Make concrete well-defined suggestions to improve environmental quality.

6. Encourage involvement of the University of Wisconsin-Green Bay in off-campus projects relating to environmental quality.

7. Develop guidelines for getting the job done and hold progress conferences.

8. Circulate letters to state and local organizations offering programs and speakers on environmental quality.

9. Request University Extension to sponsor weekly television and radio discussions on environmental quality.

10. Request that the Governor declare a Conservation Day.

11. Generate awareness of the need for money and extensive communication efforts to interest the public in the problems of improved environment.

Closing Remarks

Dr. Raymond D. Vlasin
Conference Chairman[1]

We have just completed a provocative and informative conference. There have been stimulating presentations and brisk discussions. It is now appropriate to ask, "What has our conference achieved?"

To prepare for this question, I have quizzed many representatives at this conference. I have asked them to "level" with me, to be bluntly frank. This is what I found.

We definitely have begun to achieve the conference purposes delineated weeks ago. We have increased the understanding of the dimensions of man's impact on his environment and the key issues involved in improving that environment through education and action. Now we must move outside our conference group.

We have evaluated some means of closing the gap between existing scientific knowledge and what is known by the lay citizen and voter. Now we must move beyond our conference group.

We have identified specific efforts that can be taken by educational institutions in cooperation with citizen organizations, government, labor and industry, and information and news media. Now we must carry them to others, discuss them with others.

In short, at this conference, we had an active commitment and involvement toward action to improve environmental quality. The acid test will be whether we can and will extend this commitment and involvement beyond the conference.

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[1] Director of Planning and Regional Development, The University of Wisconsin-Green Bay and University Extension, The University of Wisconsin.

Each of you here can exercise your influence on improving environmental quality through education. You can have your impact as an individual. You can have your impact as a member of a group. But each of you can exert a definite impact. Again, the choice is yours.

I'm delighted that in the closing hours of this conference you were able to meet together in state groups and to consider specific follow up actions in each state. The conference planners hoped that you would do precisely that. In fact, this conference would have been a failure if it had not generated follow up action. Many of you would quickly agree that we have wasted too much time on conferences and meetings that yield no tangible follow up.

To facilitate your follow up actions, Mrs. Karen Manthe and I will prepare a proceedings issue containing the presentations made at this conference. This proceedings issue can serve as an important educational document -- one for reading and discussion. To increase its usefulness for educational purposes, we will prepare a discussion outline to supplement the proceedings.

To further assist you we plan to compile a conference summary to be available for widespread distribution. Also, we will make available a list of those who attended the Environmental Quality Conference.

As a final point, I pledge to you the full support of the conference planning committee members in each state. The planning committee is anxious and willing to join with you in the next step for closing the knowledge gap on environmental quality between science and the citizen.

APPENDIX

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